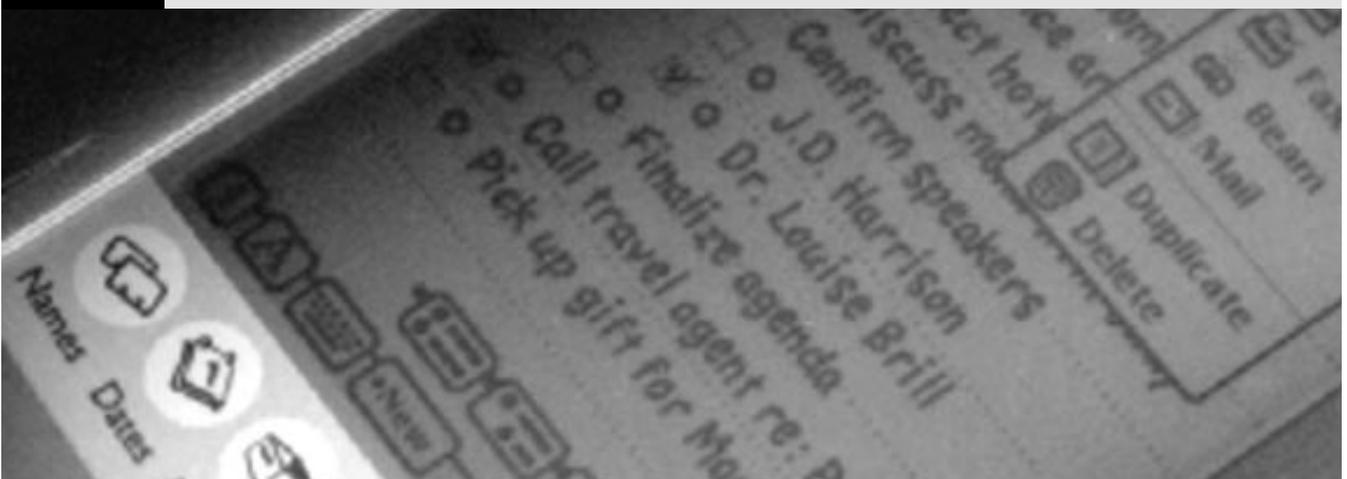


The Newton PDA Platform

A technology and feature analysis



Newton



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This section answers the question “Why PDAs?” by discussing the trends that are shaping the business world, and how PDAs can help mobile professionals and enterprise organizations. It goes on to describe the advantages of the Newton platform for creating mobile solutions—and ends with an overview of what’s new and improved in Newton 2.0.

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This section focuses on Newton 2.0’s communications capabilities. Designed to fit into complex multivendor networks, local-area networks (LAN), and wide-area networks (WAN), Newton 2.0 offers built-in faxing, printing, e-mail, and infrared beaming capabilities. By taking advantage of third-party solutions, users can also access the Internet, share information with databases, access LAN and WAN e-mail systems, and send and receive wireless messages.

Section III: Newton 2.0 and Personal Computer-PDA Integration

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Through Desktop Integration Libraries (DILs), Newton Backup Utility (NBU), and other Apple and third-party products, Newton 2.0 offers users ways to share, back up, distribute, and synchronize information between their Newton PDA and their personal computer (whether they’re working on a Mac OS or Windows software-based computer) and the enterprise. And with Newton Press, users can easily create electronic documents for use on the road—or to distribute to teams.

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This section highlights some of the mobile solutions that customers have built on the Newton platform.



Section I

The Newton 2.0 Advantage

A note to the reader: Throughout this paper, the term "PC" refers to personal computers—both Windows-based computers and Mac OS computers.

The Newton platform: A generation ahead of the competition

The Newton personal digital assistant (PDA) platform continues to gain momentum in the business world. With the advent of Newton 2.0—the second-generation platform from Apple Computer, Inc.—many companies and individuals will have reason to make Newton their platform of choice. This paper explains the advantages the Newton platform offers to enterprise organizations and mobile professionals. With a significant number of advancements and improvements in many areas—all the result of extensive customer, developer, and licensee feedback—Newton 2.0 furthers its lead in the areas critical to PDA users:

- **Organizational capabilities.** Newton 2.0 offers users an expanded capability to manage and organize information—with an intuitive user experience that offers high user productivity, while requiring remarkably little training, or none at all. Newton 2.0 offers users a host of new capabilities.

To learn more about the expanded capabilities of Newton 2.0, turn to page 11.

- **Communication capabilities.** Newton 2.0 gives users a way to connect to their world through a wide variety of wired and wireless means. The Newton platform was built from the ground up to offer communications capabilities for mobile professionals, enabling them to access key information and stay in touch, no matter where their day takes them. Users can take advantage of Newton PDA devices to access data on networks, to use information services, and to send and receive communications, e-mail messages, and faxes.

To learn more about the new communications capabilities of Newton 2.0, turn to page 13.

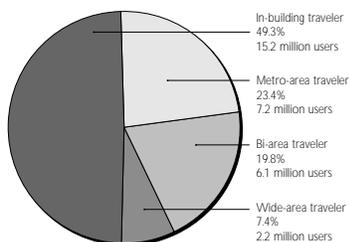
- **Integration with personal computers and enterprise environments.** Newton is designed to fit into today's complex multiplatform environments. The Newton platform offers tight integration with personal computer and enterprise environments, enabling mobile professionals to back up, restore, and share information with the system on their desk—and with the network it's on. And because the platform also offers connectivity with popular Windows and Mac OS applications, sharing and synchronizing data is easy.

To learn more about the new integration capabilities of the platform, turn to page 14.

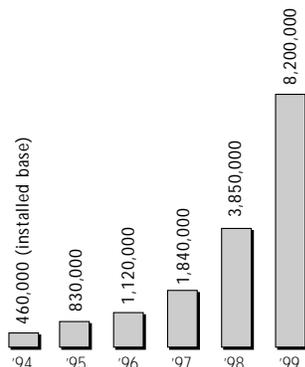
Newton: The Enterprise Solution.

Newton 2.0 brings an even higher level of connectivity and communications capabilities to Newton PDAs. Squarely aimed at the 100 million mobile professionals worldwide in horizontal and vertical markets, Newton PDAs offer users a more productive way of working—and easy access to data on local-area networks (LANs), wide-area networks (WANs), databases, and servers—through both wired and wireless means. Newton PDAs offer a way to record, access, and communicate information—at the point of activity (that is, at a client site, on the factory floor, while flying at 35,000 feet, in a meeting). All of this adds up to be one of the key reasons Newton PDAs serve as excellent companions to desktop systems.

Today's business environment— and the need for PDAs



A recent BIS Strategic Decisions study showed that the mobile professional market for PDAs is substantial. Representing 26 percent of the workforce, mobile professionals account for 31 million target users for PDAs.



The PDA market will continue to grow. Forrester Research, Inc., an independent research firm, recently conducted a study of the PDA market and projected strong growth through the end of the decade.

The business world is more complex than ever.

Before taking a more detailed look at the Newton platform, it makes sense to examine the changes in the work environment that created the need for PDAs in the first place. The business world is more complicated than it's ever been. Busy schedules, increased travel, and the need to stay on top of vast amounts of information are three pressures that confront today's mobile professional. There are major trends shaping the work world:

- Today's professionals are highly mobile.** For instance, of the 44 million professionals currently in the United States, 31 million spend more than 20 percent of their time away from their desks. Whether they're roaming a corporate campus or jetting at 35,000 feet on the way to their next business meeting, they often find themselves needing to access the resources for successfully conducting business: e-mail, corporate data, and key files and documents. Mobile professionals include not only business people, but also a range of other professionals—health care professionals who need instant access to records while making rounds, salesforce professionals who need product and customer information on sales calls, and field-service professionals who need instructions and documentation at the point of repair. Newton PDAs offer new mobile solutions for them all.
- Staying in touch is a way of life—mobile professionals must do that to stay competitive.** The proliferation of e-mail, paging systems, portable phones, voice mail, and other electronic means of keeping in touch has created a world in which professionals can be reached regardless of where they are in relation to their home office. These new ways of communicating are dramatically changing the way people go about conducting business. Being "always reachable" has become a way of life, and professionals need tools to help them deal with the resulting barrage of messages. PDAs—because of their compact size—offer new ways of keeping in touch. And because of strong communications capabilities, they also offer a powerful solution for vertical market applications—for example, auditors and inspectors can use PDAs to record data in the field, and then instantly transfer that data to personal computers and databases at the home office.

- **Keeping on top of personal and work-related information is today's challenge.**

For a better part of the 1980s and early 1990s, the quest was to give users full access to information on the network. With client-server models implemented in many companies, access is much more available than before—from personal computers, professionals are able to access many resources on corporate LANs and WANs, and the Internet. Today the challenge is to keep on top of information—sifting through it, pulling out relevant information, and using it intelligently. Mobile professionals want to take information with them—to a meeting, to a client site, to a job site—and they need to be certain that information stays in synchronization with the information on their PC and the network. (Good examples are business contacts, appointment calendars, sales information, and pricing.) It's clear that today's mobile professionals need better tools for dealing with all the information in their lives. But it's more than that: They need tools that integrate and manage both the personal and work-related data in their lives. More and more professionals are turning to PDAs to fulfill that need. Newton PDAs come with built-in functionality that enables mobile professionals to better manage the tasks, contacts, schedule, and information in their lives—no matter where their work takes them. And by taking advantage of off-the-shelf software, companies can easily customize Newton PDAs—for example, combining contact-management software, electronic-book-creation software, and expense-reporting software to create a PDA solution for salespeople.

Vertical market solutions: PDAs offer a competitive advantage.

Given the trends described above, there are two types of markets emerging for PDAs: a horizontal market of mobile professionals, and vertical markets in a host of disciplines.

With only minimal programming, PDAs can be further customized for very specific tasks. Following are some of the vertical markets in which PDAs can play a particularly important role.

- **Health care.** In the medical and health care field, very little work is done at a desk. Doctors, nurses, administrators, pharmaceutical representatives, and others all need to instantly recall vast amounts of information about patients, medications, treatments, and hospital resources. With their wireless communications capabilities, PDAs offer a whole new way of working. Rather than having to go to a library or back to an office to retrieve information, professionals in this field now have access to much of the data they need—even while making rounds.
- **Sales.** Sales professionals face many of the same challenges as health care professionals: They need to access vast amounts of information, and they are rarely at their desk. They also have to place orders, keep the home office informed, and manage inventories—all from remote locations. PDAs, thanks to their light weight and communications capabilities, enable sales professionals to achieve all these things. In addition to off-the-shelf contact management programs, it's easy to develop custom order-management programs that function as front-ends to corporate databases, electronic books that serve as cost-efficient product catalogs, and e-mail-based systems that enable sales professionals to stay in touch with colleagues and the home office.

PDAs are proving to be useful for a wide variety of vertical markets. Following are some of the key markets, their total number of potential PDA customers, and the advantages PDAs offer them.

Health Care Professionals

- Hospital automation—2.1 million (all numbers listed represent *potential* number of PDA users)
 - Patient tracking via wireless communications
- Private practice—400,000
 - PDA database access
- Home health care—500,000
 - Information management, using PDAs as a front-end to a database
- Individual practitioners—1.7 million
 - Medical reference, using PDAs as a way to carry information with them

Salesforce Professionals

- Door-to-door sales professionals—1.2 million
 - Contact management and product information
- Retail detailing—200,000
 - Order entry via PDA as a front-end to a corporate database
- Route delivery—200,000
 - Catalog of products kept on PDA
- Manufacturing sales automation—1 million
 - Pricing and product information distributed on PDA
- Insurance agencies—200,000
 - Inventory management
- Pharmaceutical sales—40,000
 - Electronic mail from remote sites
- Real estate sales—700,000
 - MLS listing database access via PDA

Field Service Professionals

- Utility service—200,000
 - Dispatch, using PDA wireless communications
- Telephone company service—80,000
 - Testing, using PDA database
- Cable television—33,000
 - Inventory, taking advantage of host integration
- Field service—1 million
 - Documentation
- Manufacturing—1.5 million
 - Quality control and process control

- **Field service.** Among the many other professionals who spend their time on the road are service professionals who work in the field repairing systems, installing systems, or maintaining systems. For them, on-line product documentation, quality control and procedure instructions, and a means of staying in touch with dispatch are critical. PDAs are small handheld devices that make it possible for field-service professionals to take instructions and procedural information right to the place where they're servicing a system, whether it's a factory floor, computer room, or manufacturing line.
- **Education.** Educators spend the course of their day with their students, yet they also need to plan and organize lessons and record the progress of their students—all of which requires time and careful thought. With a schedule of classes all day long, planning lessons and documenting student progress often happens long after the students have gone home. With PDAs and specialized software, educators can gather critical information in an inobtrusive manner while their students are actively engaged in learning. PDAs provide educators with a high degree of flexibility as they move around a classroom, recording observations about students, thoughts about changes in a lesson plan, and notes on information to research. Information such as class attendance, student performance, curriculum design and instructional strategies can be sent to a Mac OS or Windows computer database, imported into other applications, or printed in a variety of report formats. Administrators can use PDAs to collect school improvement data or to do staff evaluations, and students are using PDAs to document their own progress in learning situations. PDAs are a flexible tool for documenting the learning process—in real time.

In short, PDAs are being deployed in a wide number of environments—from automobile showrooms to factory floors, from airline tarmacs to educational settings, from salesforce systems for some of the world's largest companies to custom applications for small teams. The next section of this paper explains what Newton PDAs offer for mobile professionals. And for more information about companies and organizations that are deploying Newton technologies, see the Newton case studies on page 35 in Section IV.

The Newton PDA advantage: An advanced platform for mobile solutions

Newton PDAs offer new capabilities—in an integrated package.

Newton PDAs give users the best of all worlds: They offer the advantages of many of the devices that mobile professionals depend on—notebook computers, pagers, and portable phones—without the limitations. Newton PDAs offer the processing power and information access of the average PC, yet they're far more portable than even the smallest subnotebook computer. And since Newton PDAs turn on immediately, users can record and retrieve information without having to wait for applications to launch. Since they're portable and unobtrusive, Newton PDAs make ideal messaging platforms for sending information through wired or wireless means—even, say, at a meeting or other venue where other tools prove too distracting. And, perhaps most important, Newton PDAs are designed to coexist with personal computers—both Mac OS and Windows-based personal computers—so that users can synchronize between their PDAs and computer systems. Furthermore, the Newton platform has been built from the ground up to fit into complex, multivendor environments.

Here are some of the advantages that Newton PDA devices provide:

- **Mobile data capture.** Because of their portable, handheld form factors, Newton PDAs make ideal data-capturing devices—whether for heavy-duty industrial uses such as gathering inventory data, or for taking notes in a meeting. They're unobtrusive, and easy to use. So whether you're jumping out of a cab and merely want to jot down the fare on your expense report, or you're a repair person filling out a form at a customer site, Newton PDAs offer a variety of mobile solutions to make the task easier.
- **Information organization—quickly and effortlessly.** For mobile professionals who need to stay on top of the little bits of information in their lives—appointments, telephone numbers, addresses, notes—Newton PDAs offer an ideal way to take a personal information management (PIM) application with you everywhere you go. Newton PDAs enable you to recall information—instantly. They offer third-party applications that are specially designed for mobility and are ideally suited for the range and volume of information that people need to manage—from appointments to expense receipts,

PDAs and personal computers.

PDAs aren't intended to replace personal computers and notebook computers; rather, PDAs offer functionality that complements what those systems can do. Nonetheless, it's important to point out the differences between these types of systems:

Notebook computers:

- Are portable
- Are lightweight
- Store data in discrete files
- Offer strong communications capabilities
- Take advantage of applications designed for mobility
- Require time to launch applications

Newton PDAs:

- Are highly portable; people can even use them while walking, and while working standing up
- Weigh even less—on average, about one-sixth the weight of a notebook computer
- Store data in a universal data "soup" that can be more quickly accessed by all applications
- Let users concentrate on applications, not files; automatically save information when it's entered
- Offer strong communications capabilities—and an ability to easily send and receive real-time communications "on the fly"
- Lets users do more while mobile—collect data while roaming, receive pages, collect and synchronize expense data, and more
- Give users instant access to information and applications—no "boot-up" time required

from call logs to rental-car confirmation numbers. And because many PDA applications also have direct links to popular Windows and Mac OS desktop applications, they can be a useful addition to the PC tools you're already using.

- **Strong communications capabilities.** Newton PDAs offer a multitude of options for communicating with others: built-in fax-send and fax-receive capabilities, access to on-line messaging and information services, access to e-mail services, and call-logging and contact-management features. They were designed from the very beginning to support a wide range of communications software and hardware; they offer users convenient access to timely information.
- **Smaller, lighter, less expensive.** Newton PDAs offer a significant size advantage—they're lighter, less expensive, and smaller than PCs. Though it may seem like a rather insignificant point, the fact that a PDA can be up to six pounds lighter than a portable PC starts to make a significant difference on that long trek to the final boarding gate.
- **All this—and PDAs can be integrated into your world.** Of course, all these capabilities are really worth having only if they merge with your work and the world of your personal computer. Newton PDAs, such as the Apple MessagePad and the Motorola Marco, are being integrated into computer networks and used as companions to PCs and enterprise systems. Users can easily back up important information from a Newton PDA onto their PC; take PC files and data with them on the road using a Newton PDA; and keep everything synchronized. Newton PDAs offer critical connectivity, along with data-sharing and synchronization capabilities.

Momentum.

The Newton platform provides the foundation for a whole new generation of off-the-shelf applications. These applications have been created by familiar names in the industry—Intuit, Claris, Now, ON Technology, QUALCOMM, and a host of other innovative companies. The platform supports an increasing library of applications for health care markets, salesforce automation, field service, and education, to name a few. The Newton platform is open and accessible; it offers a wide array of development tools, enabling the quick creation of applications for rapid deployment. Apple also has an extensive systems integrator and VAR program.

Strong partnerships.

At the heart of the Newton platform is a widely licensed operating system. Companies that have licensed Newton technology include leading international firms such as Alcatel, Harris Corporation, Matsushita Electric Co., Ltd., Motorola Corporation, Schlumberger Ltd., Sharp Corporation, Siemens, and Digital Ocean. Motorola, Harris Corporation, and Digital Ocean already have Newton-based products, and other products based on the Newton platform are expected as the market expands and applications of PDAs become more prevalent.

Apple is currently working with more than 200 systems integrators and value-added resellers (VARs) to create custom solutions for markets in fields as varied as health care, education, real estate, data collection, and salesforce automation. In addition, even before the launch of Newton 2.0, Apple has been working with more than 900 software developers, including Intuit, Lotus, Now, ON, Claris, and other

established companies—all of which are developing Newton 2.0 software products.

Newton 2.0: What's new, what's improved

Newton 2.0: Apple continues to innovate.

With the help of PDA users, Apple Computer has invested many hours in testing the Newton operating system—improving functionality, performance, the graphical user interface, and virtually all other aspects of the system. With two years of market momentum and testing behind it, Newton 2.0 represents a major advancement in PDA development. The Newton platform has been designed to offer a complete solution that keeps business professionals organized, in communication with their colleagues even while on the go, and connected and integrated with PCs, LANs, WANs, and other networks.

Organizational capabilities.

Newton 2.0 offers a strong set of organizational functions—built in. These capabilities include:

- **The capturing of ideas and information.**

- *New and improved recognizer for printed words.* Enables Newton devices to read unconnected, printed text. It recognizes each character, letter-by-letter, which greatly improves accuracy of recognition. With Newton 2.0, Apple has made improvements in cursive recognition as well.
- *Ink text.* Enables the user to use digital ink to take notes or to jot a quick appointment; notes get neaten up, but they remain in handwritten form and can be transformed to printed text later. For many types of information—appointments, directions, quickly taken notes—users have found it's more helpful to keep the notes in their ink form, and translate them to printed text later.
- *External keyboard.* The Newton Keyboard from Apple connects to Newton PDAs, so users can type quickly on their PDA. It's especially helpful when composing long memos or e-mail messages, or taking extensive meeting notes.

—*Smart lists.* People are creatures of habit; they work with the same companies, fax to the same people, take calls from the same vendors. Newton is intelligent enough to keep track—and to offer the user lists of most commonly entered information or actions to take. This feature eliminates repetitive actions and makes entering important information simple and quick.

- **Personal information management.**

—*Names.* Enables users to easily record and recall names, addresses, telephone numbers, and important contact and personal information. Users can store information about hundreds of people, and they have the ability to customize the type of information stored on a person-by-person basis. For instance, users can specify that an entry has two e-mail addresses, while another has, say, six phone numbers. Newton 2.0 also allows users to group people, so correspondence can be addressed to an entire group without the need to choose each person individually.

—*Dates.* Enables users to keep a calendar, to-do lists, and reminders. Dates comes complete with an alarm to keep users on schedule, and also a repeating-task feature so users can schedule recurring events, such as weekly meetings. With a variety of agenda views, users can view a day, week, or month of appointments at a time. Dates comes with an integrated to-do list that automatically rolls over to the next day's list.

—*Notes.* Enables users to take notes that include free-form notes in ink text, and even graphics. As a user writes, those notes can be converted to typed text; users can also opt to have notes converted later, rather than translate notes while they're being taken. As part of Newton 2.0, Notes offers stationery. Users can pull up different stationery, depending on what they want to do. Newton comes with new checklist stationery to help users keep track of lists; it also offers new stationery for creating outlines or multitopic meeting notes. PelicanWare—a third-party company—has developed a spreadsheet stationery called QuickFigure Pro. You can start to imagine the other types of stationery that will be developed: mileage calculation stationery, graph paper, job-cost stationery, and so forth.

—*Calls.* A new application that's part of Newton 2.0, Calls keeps track of a user's incoming and outgoing phone calls. Calls helps dial the phone, keeps track of the time of each call, and automatically files completed calls for future reference. Calls is fully integrated with Names and the Newton autodialer.

- **Third-party applications.**

—*A range of capabilities.* Here, too, in addition to the built-in applications that come with Newton, are a number of compelling solutions from third parties. They include applications such as Pocket Quicken from Intuit for managing money and financial information; this version even makes it easy to keep your financial records synchronized with Quicken on your Windows or Mac OS personal computer, via the Quicken Connect Utility. Or you can manage your travel itinerary, with software such as Gulliver from True North, Inc. Of course, Newton 2.0 has been built for easy applications development, so you can expect the same level of enthusiasm that the previous version of the platform enjoyed—literally more than a thousand applications.

Communications capabilities.

Newton 2.0 offers a multitude of communications options. Many communications functions are integrated, and others can be added later—depending on what a user needs. The Newton platform makes it easy for users to do the following, via wired and wireless networks:

- **Send and receive faxes using a Newton PDA (built-in fax receiving is a new capability enabled by Newton 2.0 software).** Not only can users send faxes from their Newton PDA, but with Newton 2.0 a mobile professional can receive faxes as well. Received faxes can be annotated—and then resent. While it was not designed as a replacement for the office fax machine, the fax capability of Newton 2.0 enables users to do some rather remarkable things. Say, for instance, a manager is between meetings and someone wants to send her a fax with directions to a meeting that's been moved—she can simply connect her Newton PDA to a cellular phone or GSM digital phone and receive them.
- **Send and receive e-mail via the Internet.** Newton 2.0 has been designed to connect with a variety of public e-mail services (such as America Online, CompuServe, and eWorld), LAN e-mail networks (such as CE QuickMail, Lotus cc:Mail, and Microsoft Mail), wireless mail services (such as RadioMail and WyndMail), and Internet mail (such as Eudora SMTP/POP mail). Client applications for these services are available from third parties for the Newton platform. The e-mail client comes built in.
- **Access the Internet.** One of the fastest-growing segments of the computing industry is the Internet. In the first half of 1996, Apple will deliver a TCP/IP software package as part of the Newton 2.0 platform. That package, in conjunction with other third-party software products, will allow customers to directly access the Internet for Internet mail, as well as to access information on the World Wide Web, using a modem connection to an Internet services provider.
- **Print documents created on a Newton PDA.** Newton enables you to print to a variety of office printers—whether they're connected to computers running the Mac OS or Windows. Anything that can be created on the screen of a Newton can be printed—schedules, notes, contacts, call logs, and so forth.
- **Send and receive paging messages.** With third-party PC Card paging cards and software, users can send and receive paging messages with their Newton PDA.
- **Share information by “beaming” it to other users.** By taking advantage of the infrared technology built into Newton products, users can send information to other Newton users who are in close proximity. Some third parties supply software that lets users beam information to PCs and printers, as well.
- **Take advantage of the Newton Universal In and Out Box.** Newton makes communications easier and simpler by giving users a Universal In and Out Box. These boxes serve as the central location for all incoming and outgoing communications. Newton 2.0 enables you to quickly scan items in your In Box and filter the ones you want to read.

For more information about the Newton communications solution, see page 17.

Personal computer and enterprise integration.

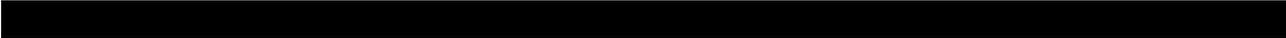
The Newton platform is designed to serve as an ideal companion to Windows and Mac OS personal computers. Newton 2.0 offers a number of options to connect:

- **Direct synchronization.** One of the biggest challenges when using a PDA is that when users are on the road, they're constantly adding data to their PDA—and changes are also being made to that same data back in the office. A group calendar and a shared database are good examples. Newton 2.0, combined with third-party software, provides a way to keep all that information synchronized. The Newton platform lets users synchronize PC files with data on a Newton PDA—so, for example, a user's list of contact names and phone numbers on a PC can be synchronized with those on a PDA. Customers need direct synchronization between their PDA and specific applications on their personal computer. To help make this possible, Apple has developed the Desktop Integration Libraries (DILs). DILs now make it possible for developers to make their PC applications talk directly to applications running on a Newton PDA. Customers who use the following PC software can seamlessly synchronize the information residing in the application with information on their Newton PDA: Microsoft Schedule +, Now Up•to•Date and Now Contact from Now Software, Claris Filemaker Pro, and MeetingMaker from ON Technology.

Other utilities currently in development are expected to provide users with the ability to import and export text files and information between a PC and PDAs—for example, word processing documents. (For more about these solutions, see Section III beginning on page 27.)

- **Critical reference information.** Apple's new Newton Press application provides a convenient drag-and-drop method of publishing electronic documents. Using a Windows or Mac OS personal computer, all that users have to do is drag and drop text files, word processing files (including Microsoft Word, WordPerfect, and MacWrite II), graphics, e-mail, and reference information onto the Newton Press icon—and an electronic document is automatically created for their Newton PDA. It can be formatted and imported into a Newton PDA to be viewed, faxed, annotated, and even printed. It can even be distributed to other Newton PDA users. This is a great solution for mobile professionals and corporate customers who need to keep track of flights, itineraries, confirmation numbers, price lists, product information, maps, catalogs, and user manuals.
- **Safety net.** Apple's Newton Backup Utility (NBU)—another Newton 2.0 platform product—gives users backup capability for archiving Newton data. It keeps data safe by making it easy to back up Newton PDA information onto a PC—and restore that information when users need to use it again. NBU also allows users to download packages from a PC to a Newton PDA to install software and other files.

For more information about Newton 2.0's integration capabilities with personal computers and the enterprise, see page 29.



Section I1

Newton 2.0 and Enterprisewide Communications

A note to the reader: Throughout this paper, the term "PC" refers to personal computers—both Windows-based computers and Mac OS computers.

Newton 2.0 and enterprisewide communications

The definition of “work environment” is rapidly changing. During the day, people are roaming farther and farther from their base of operation, whether it's a corporate desk, sales headquarters, or home office. Information needed to do a job well no longer resides just on a local hard drive, but also on servers maintained by in-house MIS staff—or by remote information service providers. It's easier than ever for people to work where they want to; what's complicated is that there are now multiple ways for keeping in touch and getting to the information users need—all of which require different protocols, interfaces, and software.

Newton 2.0 and the new work environment

The workplace is evolving from the traditional business office to virtually any place a professional can carry a personal digital assistant (PDA). PDAs are becoming indispensable as integrated productivity tools for working anytime, anywhere.

Newton PDA technology is entering its second generation, leading the industry as the most advanced PDA platform. The Newton 2.0 communications architecture is the foundation for powerful features and tools for organizing information and integrating a PDA with a PC. And beyond that, it gives users important communications tools.

- **Newton 2.0 provides a multitude of communications solutions.** Whether users require messaging, fax, Internet access, database access, information access, or PC connectivity capabilities, they'll find it in Newton 2.0, which has been designed from the ground up to support a range of solutions in all these areas. This capability accommodates the emerging reality of the decentralized workplace and the global marketplace—and lets users work anytime, anywhere, without being limited to any one particular method of communication.

Using Newton PDAs for communications in enterprise computing environments.

As corporations and institutions rely more and more on networks for sharing and accessing information, Newton 2.0 technology is right in step, with built-in technologies that allow users to use a PDA for communicating within almost any information infrastructure. For example, PDAs running Newton 2.0 software support software that allows users to do the following:

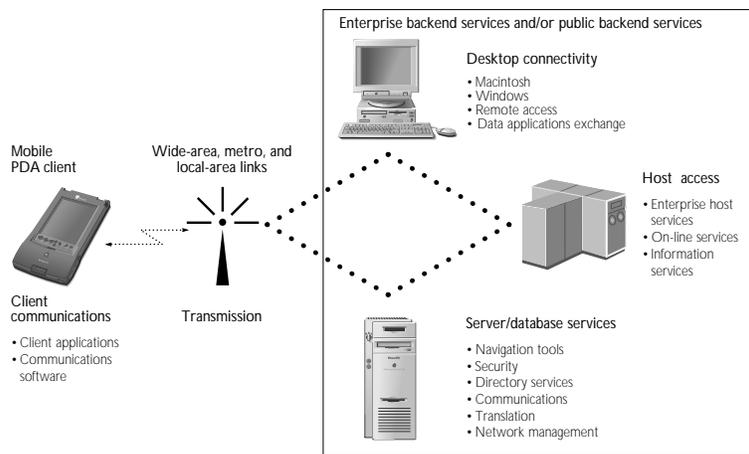
- Access corporate LAN-based e-mail from a remote location
- Access a document that resides on a World Wide Web server
- Receive faxes while waiting in the airport, in a hotel room, or in a taxicab
- Send and receive wireless messages—pages—over paging networks
- Integrate inventory data collected in the warehouse, with a database on a PC in the office
- Send clinical notes on a medical patient to a colleague at a teaching hospital by modem
- Connect to a standard phone, a cellular phone, or a GSM digital phone to dial-in to e-mail while on the road
- Use a Newton PDA as a VT100 terminal emulator, to access data in a database on a server
- Print an expense report on the department printer
- Download the most recent price list from a server at headquarters while at a client site
- Fill out a service report on a broken utility pole and faxing it to the dispatch center

- **Newton 2.0 supports a broad set of communications technologies.** To the benefit of mobile users, whether they require wired or wireless means to exchange information, Newton 2.0 products support their needs with a wide range of communications protocols and standards, including the following:

- Facsimile, send and receive (built in)
- E-mail (built in)
- Paging
- Internet protocols (TCP/IP, UDP, PPP)
- Standard phone line with modem
- Cellular (AMPS, digital GSM)
- Packet radio networks (ARDIS, CDPD, RAM)
- PCS* (CDMA, PCS-1900, TDMA)
- Short message services (SMS)

Newton PDAs can be easily integrated into existing company networks. Functioning as a client front end, Newton PDAs can serve as a user's central view of his or her world. Information can be sent and received using wide-area and local-area links—via public-switched networks, circuit or packet, or radio. Data can be shared with PCs, servers, and databases, as well as legacy systems.

Newton PDA as a mobile client in an enterprise integration solution



*Future capability, as PCS systems become available.

The Newton 2.0 communications architecture

Newton 2.0 was designed to handle current and future communications needs. This is possible because the Newton 2.0 communications architecture was developed to offer several key advantages to in-house development teams and independent software developers—advantages that make Newton 2.0 the most robust and flexible platform for PDA development. For example, Newton 2.0 is a completely modern, modular, object-oriented interface with a variety of built-in communications tools, networking support, and protocol support, so developers can spend their time building flexible solutions rather than working on underlying communications-enabling technologies. Thanks to this flexibility and power, Newton 2.0 is an open PDA platform for communications—one that is suited for the range of communications methods used by people in enterprise-computing environments.

To read more about the Newton 2.0 communications architecture, please refer to the paper titled [Developing for Newton 2.0](#).



The Newton communications architecture enables users to take advantage of cellular devices to connect to e-mail systems, dial-in services, and fax machines.

Communications solutions supported by Newton 2.0

Using Newton PDAs and Internet Technology to Access Corporate Databases.

There is a new trend in businesses and homes worldwide: every day, millions of people are browsing the Internet, to perform research, keep current, and communicate with one another. To capitalize on this huge audience, organizations are taking advantage of the HTML (HyperText Markup Language) and World Wide Web technology as a front end to their corporate databases. And this is becoming easier for companies to do, thanks in part to the growing availability of off-the-shelf tools like those that automatically translate SQL (the language of most large relational databases) to HTML.

Mobile professionals depend more and more on the information they obtain from the World Wide Web—and tools and solutions for mobile platforms are also more readily available to accommodate this demand. This makes using Internet technology as a “gateway” to corporate data a logical, economical move. There are two key reasons for this:

- No change is required to the actual corporate database. The “gateway” to the data is the only part that requires additional MIS development.
- Developers don't need to write special applications for mobile clients, as long as those clients support TCP/IP and an HTML browser.

The critical advantage of the Newton 2.0 PDA is that the architecture has been designed to accommodate a wide range of communications solutions. As enterprises diversify and information is communicated through a variety of methods, the Newton 2.0 communications architecture enables a Newton PDA to function as a powerful, efficient portable client to multiple information sources in an enterprise—PCs, wired and wireless networks, and printers—giving users a number of communications options.

Information access and the Internet

Connecting to the Internet by using a PDA promises a wealth of opportunities for corporate users and mobile professionals. They can use a Newton PDA as a VT100 terminal emulator to access UNIX text-based Internet servers. Or through a PPP dial-up connection, they can gain direct access to the Internet using the TCP/IP stack. The Newton 2.0 communications architecture allows the following services for users who wish to access the resources of the Internet:

- **E-mail access.** Using a dial-up connection with a modem or wireless LAN, Newton PDA users can read and respond to their Internet (SMTP/POP) e-mail.
- **Database access.** Users can dial into a corporate World Wide Web server on the Internet, or a private corporate network, to fill out HTML forms, read text files, and perform data-access tasks to get at information such as price lists, product information, and other proprietary data. This allows corporate users to access their corporate databases from their Newton PDA. These corporate databases might be SQL-based ORACLE or Sybase databases, for example.
- **Information access.** Mobile professionals can access most private and public information sources (free, subscription-based sources) using the Newton TCP/IP and World Wide Web technology (available in early 1996) or VT100 terminal emulation.
- **Information services via World Wide Web.** General information services—such as corporate product information, special-interest groups, and research material—can be accessed by a Newton PDA through third-party Internet applications.
- **Corporate data.** A number of third-party applications have been developed to seamlessly tie the Newton PDA into corporate databases. These solutions include Newton client applications tailored to a corporation's needs, and a network server for transferring information between the corporate database and the Newton PDA.

- **VT100 terminal emulation.** Newton 2.0 allows users to view their PDA screen in landscape format, as if it were a terminal. In this way, the PDA can act as a front end to corporate databases or other in-house information resources.

Personal computer connectivity solutions

Newton 2.0 provides Newton PDA users with access to their PC running either the Mac OS or Windows. A Universal In and Out Box provides a common access and control capability for most communications, including e-mail, faxing (send and receive), IR beaming, wireless messages, and printing. With Apple and third-party products, users can take advantage of the following functionality:

- **Serial connection.** Using a serial cable and Apple or third-party software products, users can connect directly to their PC to back up Newton PDA data, selectively restore it, import and export files, and synchronize information from their PDA to their PC applications (for example, name and address file synchronization, calendar synchronization).
- **Remote dial-in.** Using a modem—either a PC Card modem or an external modem—users can access files and data on their PC at up to 28,800 bits per second, no matter where they are. For example, users can call in from the road and transfer an important memo from their office PC to their Newton PDA.
- **AppleTalk connection.** Users can connect to an AppleTalk network by using an AppleTalk connector or wireless LAN technology. This allows 230 kilobits-per-second access to any Mac OS system on an AppleTalk network. AppleTalk allows files to be transfer-red from a file server, applications to be installed on a Newton PDA, and data to be printed from a Newton PDA to a printer connected to an AppleTalk network. Wireless solutions are available from Dayna Communications, Inc. (DaynaCOMM Roamer) and Digital Ocean (Grouper).



Newton PDAs enable users to access and share data with a wide variety of enterprise devices. Through wired and wireless means, and using optional software, Newton PDAs can connect to LANs to access PC and corporate data.

Messaging

Newton 2.0 provides solutions for the different types of messaging that users are accustomed to—and it's built to handle new messaging technologies in the future.

- **Public e-mail.** By using a modem, Newton PDA users can stay on top of their electronic mail, because Newton 2.0 has a built-in eWorld mail client that links to all public e-mail systems—even those on wireless networks. The Newton PDA can send and receive mail to users connected to the Internet, including America Online, AppleLink, AT&T Mail, CompuServe, Delphi, EasyLink, eWorld, GEnie, MCI Mail, Microsoft Network, Prodigy, RadioMail, and WyndMail.
- **LAN-based e-mail.** Newton PDA users can send and receive e-mail to and from people with LAN-based e-mail, using Internet gateways or directly using third-party client applications, such as cc:Mail, Microsoft Mail, or QuickMail.
- **Paging.** Through the Newton 2.0 communications architecture, mobile professionals can use a Newton PDA to send and receive wireless pages. Using a PC Card paging receiver, all messages are received into the Universal In and Out Box. Through paging technology support, Newton 2.0 can accommodate automatic wireless updates to databases.
- **SMS.** Short Messaging Services on GSM and PCS-1900 cellular networks allow the use of a Newton PDA to send and receive wireless messages.
- **Infrared networking.** Because Newton 2.0 has built-in infrared networking technology, Newton PDAs can exchange information with one another by “beaming” data such as notes, name and address cards, and call records.

Faxing

Newton 2.0 provides significant enhancements in faxing capability.

- **Send and receive capability.** Newton PDA users can not only send faxes from their PDA, but can also receive faxes—and annotate them before sending them back or forwarding them to someone else.
- **Dialing and integration with Names files.** It's never been easier to use name and fax number information stored in Names files when creating and sending faxes. Newton 2.0 now supports complex dialing codes and multiple phone numbers.

Connectivity and communications protocols

With technology advancing so quickly, there is no one connection standard that applies to all communications methods and solutions. In order to provide the broadest possible range of solutions, the Newton 2.0 operating system has been designed to support a range of communications protocols and networks.

Modem support

Newton 2.0 allows Newton PDA users to connect a modem via the serial port or through a PCMCIA-standard PC Card modem, supporting data transfer at up to 28.8K bits per second—the maximum industry standard. This gives Newton PDA users the quickest possible connection to the information they need, no matter where they are.

Cellular and digital GSM support

Because Newton 2.0 supports cellular modems, Newton PDA users can connect their cellular telephones to their PDA and access e-mail or other dial-in services. Newton 2.0 supports the GSM communications standard, which is widely used in Europe and will be used in the U.S. by many PCS providers. Businesses are relying on cellular and GSM digital networks for mobile communications at an increasing rate; Newton 2.0 ensures that mobile professionals can take advantage of these networks with their PDAs, as well.

Paging

Using a Newton PDA and third-party software, users can originate messages to other pagers through a dial-up connection, as well as receive messages. Newton 2.0 also supports Short Message Service—which is common in Europe—through third-party software. Paging is just another way in which mobile professionals can keep in touch with their offices and clients.

TCP/IP and AppleTalk network connectivity

Newton PDAs let users communicate over powerful networks.

- **Access to the Internet through a TCP/IP connection.** In the first half of 1996, Newton 2.0 will support data transmission over TCP/IP networks—the standard network protocol for accessing the Internet and many corporate networks. Through TCP/IP, users can send and receive e-mail, and access files on the World Wide Web, using their Newton PDA and third-party software.
- **Access to corporate LANs.** Newton 2.0 provides an extended AppleTalk stack, so users can access a local AppleTalk network from any node just by connecting to that node's AppleTalk connector.

Wireless LAN

Some mobile professionals need to stay connected to a local-area network—in a warehouse, for example, or on a large campus—even though they must roam the area continually. Newton 2.0 lets mobile users stay connected to their LAN through wireless means using their Newton PDA—while maintaining a high data-transmission rate. This “wireless Ethernet”-type capability provides true mobility for many vertical uses.

Packet radio

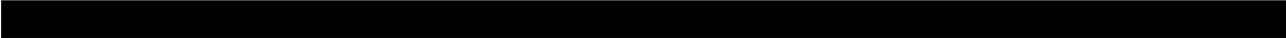
Today, there are PC Card solutions that allow Newton 2.0 PDA users to take advantage of ARDIS and RAM two-way wireless packet radio services. These services provide nationwide wireless data transmission in the U.S. In Europe, Mobitex networks (Ericsson) are available. And throughout Asia and the Pacific Rim, DataTAC networks (Motorola) are widely available.

CDPD (Cellular Digital Packet Data)

This cellular technology allows digital data transmission over cellular channels. CDPD allows high throughput of wireless data. So far it has mostly been adopted for vertical applications.

PCS (Personal Communication Services)

Newton 2.0 has the communications architecture to support the future PCS 1900, TDMA, and CDMA data systems. These systems will be implemented in the U.S. over the next few years. They promise to bring lower-cost wireless communications and advanced services.



Section 111

Newton 2.0 and Personal Computer-PDA Integration

A note to the reader: Throughout this paper, the term "PC" refers to personal computers—both Windows-based computers and Mac OS computers.

Newton 2.0: Integrating PDA and PC information

The need for PC-to-PDA integration

Apple has spent significant research dollars and hours investigating what PDA users want in terms of integrating their Newton PDA with their PC. With mobile professionals conducting more and more business away from the office, the ability to easily access, work with, and exchange data between PCs and PDAs is becoming especially critical. Users have expressed considerable interest in three key capabilities for their PDAs:

- **Synchronization.** The types of information these mobile professionals and corporate customers need, such as personal-contact files, meeting agendas, e-mail, price lists, database records, and project notes, often reside in more than one place—most commonly, on a PC or server, and a PDA. To make sure they're working with the most current information, workers must have the ability to easily exchange and update information between their PC or network server and PDA—whether in their office or from a remote location.
- **Data security.** Keeping data safe, and archiving it to free up space, are also priorities.
- **Information distribution.** PDA users want to be able to access information on their PC, and use it in a format that is more appropriate for a PDA—such as an electronic book.

The advantage of Newton 2.0

To this end, the Newton 2.0 platform has been designed to provide the basis for a complete suite of solutions for integrating PDAs and PCs and enterprise environments, without changing the way people use their PCs. Built-in capabilities, along with add-on PC utilities and developer technologies from Apple and third parties, provide the functionality users require in Newton 2.0—functionality for making their Newton PDA a powerful extension of their PC and enterprise environment, with the following advantages:

- **Windows and Mac OS connectivity.** Newton 2.0 provides full cross-platform connectivity, so Newton PDA devices can be easily integrated into both Windows and

Integration of PDAs and PCs in Enterprise Environments.

Newton PDAs have become more than devices for strictly "personal" use—increasingly they're being adopted by mobile professionals and corporate users as a critical business tool. This trend will continue to strengthen as Newton 2.0 continues to provide powerful connectivity to the desktop environment. The ways in which PDAs can be used in the enterprise environment are as varied as they are numerous:

- Synchronizing contact files between a Newton PDA and a PC.
- Accessing a corporate server from a remote location, to download software into a Newton PDA.
- Backing up all PDA data on a PC or server, for archiving purposes.
- Collecting inventory data on the warehouse floor, and later exporting it into a spreadsheet on a PC.
- Updating a hospital calendar that resides on a department server, while on the road.
- Using the Newton Keyboard to input data into a Newton PDA.
- Creating an electronic meeting agenda and notes while in an airplane, and distributing it electronically as a Newton Press book to a team of Newton PDA users.
- Receiving a fax from management, annotating it, and faxing it back with comments written on it in electronic ink.
- Conducting a site inspection, and printing the report by simply connecting a cable to the printer.

Mac OS environments—including Windows 95. This capability was a key requirement of users and developers alike, especially those with the need to tap into the proliferation of mixed computing environments in companies, schools, and other organizations.

- **Connectivity to an enterprise.** Newton 2.0 has a sophisticated communications architecture that gives users easier access to their corporate computing environment, whether they're at a desk in their office building, or miles from headquarters. (For more information, please refer to **Section II—Newton 2.0 and Enterprisewide Communications.**) This architecture includes connectivity to a corporate network, as well as individual PCs or workstations.
- **Data security.** The Newton 2.0 platform, by providing seamless connectivity to PCs and a variety of backup and restore features, helps ensure the safekeeping of user information. This is especially useful for users working with information from remote locations.
- **Productivity tools.** The Newton 2.0 platform offers products and technologies that allow users to extend what they can do with information—for example, synchronizing it between applications, publishing electronic books, and performing PC connectivity tasks from remote locations.

To satisfy these needs, Apple and third parties are providing a range of solutions designed for Newton 2.0. More details about these products and technologies follow.

Direct synchronization of PC and PDA data

Desktop Integration Libraries (DILs)— Integrating data from the PC end

Newton 2.0 incorporates a rich set of tools for developers, enabling them to create direct links between applications on PDAs and PCs so users can synchronize PDA data directly with the PC applications they use every day. The key technology for such PDA-to-PC integration is Apple's Desktop Integration Libraries (DILs).

DILs make the Newton PDA an extension of the PC platform. Simply put, DILs are application programming interfaces (APIs) that developers have integrated into their PC applications, to let users access Newton PDA data from the PC. DILs help match the functionality of data used on a Newton PDA with the corresponding data in a specific application running on a PC, and they do so with such tight integration between applications that users needn't undertake intermediate steps—such as using conversion utilities—to get the data to match. This is especially helpful when using personal information management (PIM) software, such as appointment-scheduling applications, because it allows users to keep the data in PDA PIMs current with data in a PC PIM.

DILs also enable import and export of names and dates information.

For some users, a Newton PDA is the primary information manager—in which case, they might want to import a set of names and appointments from their PC to their Newton PDA. Through DILs, developers can enable their applications to transfer that data.

DILs are part of Apple's long-term strategy for the Newton platform. More and more applications are being created using DILs technology to provide direct integration between users' PC application of choice and their Newton PDA, without the need for an intermediary utility. The flexibility and simplicity that DILs contributes to applications make Newton 2.0 an even more attractive platform in an enterprise environment.

DILs Case Studies.

DILs played a critical role in the development process for a variety of third-party applications for the Newton 2.0 platform.

- **Now Up-to-Date and Now Contact**

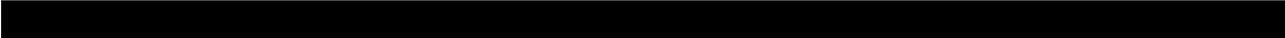
Schedule and contact data kept in these popular Mac OS-based information-management applications can now be synchronized with information kept in a Newton PDA.

- **ON Technology MeetingMaker**

PC users—on both Mac OS and Windows-based systems—needed a way to synchronize the personal schedule they keep in MeetingMaker, with the schedule they keep on their Newton PDAs. Now Newton PDA users can be sure they aren't missing any meetings or appointments when they leave the office.

- **LandWare Sync + for Microsoft Schedule +**

LandWare, Inc. saw a need for Windows PC users to synchronize their Microsoft Schedule+ files with the personal schedule they keep on their PC. This software allows users to do so without losing any data, so they can have the most accurate, up-to-date daily schedule with them at all times.



Newton 2.0 integration solutions from Apple

Integration from the PDA side

Apple Computer, Inc. and third parties supply software that enables people to get the most out of using a Newton PDA in conjunction with a PC, whether it's running Windows or the Mac OS. Some of these software products enable data exchange functions; others make the PDA more powerful by letting users tap into PC services. Apple has introduced new products for the Newton 2.0 platform—products designed to enable PC integration, and integration with a server—including Newton Press and Newton Backup Utility.

Electronic publishing on Newton PDAs: Newton Press

Newton 2.0 software gives users an easy way to combine different types of information into an electronic document and distribute it on PDAs.

Through Newton Press software, mobile professionals and corporate customers can use the combined power of PCs, enterprise information, and Newton PDAs to publish and distribute electronic books. Newton Press lets users “drag and drop” text blocks, word processing files, e-mail messages, and graphics onto the Newton Press icon on their PC screen to compose an electronic book for personal use—or to publish it for an entire group of Newton PDA users. On an enterprisewide level, this is especially useful, since documents can be easily and quickly distributed to whole teams—documents such as manual updates, price lists, approval forms, and the like.

Say, for example, a Newton PDA user is traveling to Chicago on a business trip and wishes to combine all the information about that trip into one document—e-mail containing flight itineraries, a weather report downloaded off the Internet, a top-ten list of restaurants in the area, and the electronic fax that contains directions to the hotel. The user simply drags each of these items onto the Newton Press icon on the PC—and Newton Press will create a personalized electronic Chicago booklet.

When users are publishing an electronic book for a group of Newton PDA users, certain features make it easy for readers to navigate through the document. They can make links between paragraphs (for example, they can designate that when readers click in a paragraph containing the word “Chicago,” the application will automatically turn to the page in the book containing a map of the city). They can format text with



Newton Press running on Windows 95

standard character and paragraph formatting, create borders, even invert text. And they can highlight phrases or key words and create a table of contents.

Newton Press is a flexible tool. It can integrate any imported word processing, text, or graphic document supported by Claris XTND technology* (for the Mac OS). It supports all of the most popular word processing and graphics applications on the Windows platform, including the following:

- Microsoft Word v1.x, 2.0, and 6.0
- Interleaf Publisher v1.1, 5.2, and 6.0
- PC Paintbrush
- Windows Bitmap
- WPGI (Word Perfect vector)
- ASCII

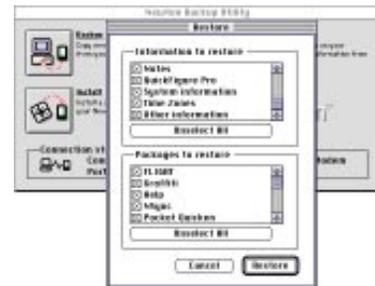
Users can also download packages to a Newton PDA directly from Newton Press by posting them on a World Wide Web site, or sending them over e-mail. Users can even beam books from one Newton PDA to another, using infrared communications technology. Newton PDA users can view, fax, forward, and even annotate the documents—and then fax them to someone with those annotations, if they wish. This is especially helpful for people dealing with meeting agendas, prototyped presentation drafts, and other information that needs to be reviewed by a group.

Data backup and restoration

Research shows that data security is a key concern for PDA users. The Newton 2.0 platform offers a simple solution for backing up Newton PDA data. It's easy to back up information residing on a Newton PDA onto a PC running either the Mac OS or Windows software—and later restore it to the Newton PDA.

The Newton Backup Utility (NBU) lets users connect a Newton PDA to a PC—and use the PC as a place to store PDA information. Users with a Mac OS-based computer connect their Newton PDA via the serial port or LocalTalk port; Windows software-based systems can be connected using the serial port. Following are some instances in which data backup and restore functions could be vital:

- Backing up an entire Newton PDA before going on a trip
- Making a weekly backup of changes made to client contact information
- Restoring a single piece of software



Newton Backup Utility running on the Mac OS

Say a Newton PDA user is in a rush to catch a plane, and wants to back up important names and dates data before leaving. Using NBU, users simply tap the "Backup" button on the Newton PDA screen, and choose where on the PC they want to store the information. To retrieve data that's been backed up, users simply click the "Restore" button on the Newton PDA screen. NBU also allows users to selectively restore any part of that information from a backup file—saving significant time. Or they can install software packages from their PC.

*A number of XTND translators are included with Newton Press.



The Newton Backup Utility allows users to download packages into a Newton PDA. After clicking the “Install Package” button on the Newton PDA screen, users are presented with a standard open dialog box, and can select the packages they wish to download. The data is stored in the Extras drawer.

Installing software and files

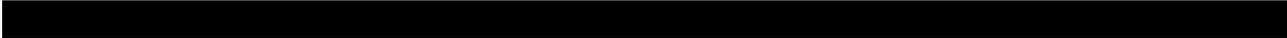
Software and data files on a PC hard disk—or on a server or storage device to which a PC is connected—can be installed on a Newton PDA in the form of a package. This gives PDA users a simple method for moving large files of information from PC to PDA. For example, when using a Newton PDA in an enterprise computing environment, users may wish to:

- Download Newton application software updates from their department server
- Search their hard disk or server for a specific Newton book that they want to download
- Have access to a large data file they reference only periodically, on their PDA
- Download the latest price list or company directory from a network server

Future capabilities

Customers are demanding more and more PC integration capabilities for their Newton PDAs. In the future, as the Newton platform matures, users will see solutions from Apple or third-parties that allow them to perform such tasks as:

- Remotely access information using a cellular modem by dialing into a PC to get information
- Easily import and export information from PC applications, such as a memorandum written in Microsoft Word
- Use a PC keyboard to enter information into a Newton PDA



Section IV

Newton 2.0 Case Studies

Newton PDAs and Ameritech Cellular Team-Up for Golf Tournament

At the 1995 Ameritech Senior Open, a golf tournament held at the Stonebridge Country Club in Aurora, Illinois, Newton PDA users demonstrated a unique application of Newton technology. Armed with Ameritech's wireless cellular digital packet data (CDPD) technology and Newton PDAs, volunteers from Ameritech and Apple Computer successfully tested a truly portable, paperless, and wireless scoring system. Ameritech and a team of integrators designed and wrote the scoring application in just six weeks. The scoring incorporates both Macintosh and PC-based servers, customized applications from Wayfarer Communications, and modems from Digital Ocean.

As part of the trial, unofficial tournament scorekeepers accompanied golfers around the course to track their scores and statistics. The scorekeepers then instantaneously transmitted the information through their handheld Newton PDA to the leader board officials via wireless CDPD technology. In turn, the new scoring system enabled the leader board to confirm golfers' strokes and other scoring information by sending typewritten messages directly to the scorekeepers' PDAs.

The tournament data was also transmitted to a server 35 miles away, where it was imported to an Apple Workgroup Server 6150 being used as an Internet World Wide Web server. Through the use of a programmed, predefined query, the top 20 scores were generated automatically into a Web page on the Internet. Other types of up-to-the-minute tournament statistics and information were also available to anyone with Internet access.

Flexibility of communications

"The wireless scoring test using Newton PDAs and CDPD technology was designed to ensure fast, accurate, two-way communication between scorekeepers, as well as enable real-time data transmission," said Brian Balduf, Ameritech cellular services product manager for enhanced data applications. Since Newton technology has a sophisticated, yet easy-to-use set of underlying communications tools, it can help developers take advantage of a variety of standard and cutting-edge communications protocols—including CDPD, which until recently was reserved for specific vertical applications.

Time savings with Newton

Traditionally, golf tournament scorekeepers tabulate scores and statistics—number of putts, distance of drives, bunker shots, etc.—on paper, and give the scoring sheets to "runners" who hand carry them to the leader board. Leader board officials then manually enter the information into a computer for tabulation—a method vulnerable to human error. But thanks to the richness of Newton communications technology, scores were sent and tabulated instantly, for a significantly lower margin of error and for greater time savings.

Newton 2.0 Helps Project Director Manage Workload

As the busy project director for the amusement ride division of a major entertainment company, Bruce Gordon uses a Newton PDA running Newton 2.0. "We have what I call a hallway culture: really important information is conveyed through numerous encounters in the hallway versus scheduled meetings," says Gordon. "With the advantages Newton 2.0 offers, I don't leave my office without my Newton PDA."

"In the hallway, associates often approach me with top-of-mind information I want to capture immediately, including vendor names, freelancers, architectural specifications, phone numbers and dates. And, they often ask me for similar information. There's no better means for navigating such instances than with my Newton PDA running Newton 2.0," he says.

Improved organizational capabilities

Gordon notes the many subtle improvements with Newton 2.0 including the checklist feature, an addition to the built-in Notes application allowing for a check box to appear by a line item. "Before using a Newton PDA, I constantly had a pad of paper in my hand. While it's effective for recording information, paper can be lost, and it doesn't allow for quick access to volumes of individual pieces of information," Gordon says.

Key to Gordon's enthusiasm for Newton 2.0 are its speed and improved handwriting recognition. "With the Newton operating system's printed text recognition capability, I can write a word I've never used before, and I know it will be captured instantaneously and correctly. This gives me confidence to take the Newton PDA into any situation where taking notes quickly and accurately is critical," he adds.

A truly mobile productivity tool

In addition to its "hallway" use, Gordon uses his Newton PDA outside the office, too. He credits Newton 2.0's send-and-receive fax capability and its landscape mode with making PDAs truly useful.

"If there is an issue at the ride construction site—a concern with the air conditioning duct in the building housing a ride—for example, I use the PDA to immediately document the problem. In landscape mode, I can sketch the duct highlighting the problem; then from the field office, fax the drawing directly from the PDA to headquarters for immediate attention. It lets me capture, maintain, and act upon information in ways that paper, handheld organizers—even my laptop—cannot achieve."

Newton 2.0 Helps Lawyer Work Smart

With offices in Los Angeles and San Francisco and a heavy caseload in both cities, lawyer Jeff Goldman prefers to work smart, not hard. That's why he uses a Newton PDA running Newton 2.0.

Personal information management

Improved handwriting recognition, interface enhancements, and connectivity capabilities in Newton 2.0 are major reasons for Goldman's enthusiasm for the product.

"For example, with the new landscape display mode, I can now capture extensive deposition notes quickly and accurately, without the need to dictate or have a clerk rekey from a legal pad," he says. "And notes can be easily downloaded via LocalTalk to client files residing on our office desktop computers."

Newton Press as a productivity tool

Goldman finds Newton Press—an application that provides a drag-and-drop method for publishing electronic documents from his Macintosh to his Newton PDA—an integral productivity feature of Newton 2.0.

"Newton Press allows me to publish specific information from my desktop computer for use at any given time. Whether it's a client file, deposition summaries, or jury instructions, the information is as close as my Newton PDA," says Goldman.

Communications capabilities win the case

Goldman comments that Newton 2.0's communications capabilities are critical to his work. He recounts a specific courtroom instance where his Newton PDA was not only a benefit, it was essential to his winning a case.

"The opposing lawyer was referencing a citation from a case I was not familiar with. So from my desk in the courtroom, using my Newton PDA, my cellular phone, and a Motorola cellular modem, I sent a fax to my clerk requesting he research and e-mail me the citations referenced as well as the full text of the case. Within a matter of minutes, I received the file, reviewed the material and was able to prove the lawyer wrong by showing the inaccuracies quoted directly to the judge. The judge was impressed and my opponent was speechless," Goldman says with a grin.

PC connectivity makes personal information management easy

A host of new third-party software also offers a variety of related benefits for Goldman. Specifically, he credits Pocket Quicken from Intuit for helping track his business expenses when in town or whether he's on the road. "The ability to synchronize Pocket Quicken with my desktop via Pocket Quicken Connect eliminates dual data entry," adds Goldman.

"My Newton PDA running Newton 2.0 is the closest I'll get to an extension of myself without graphing it to my wrist," he says. "Since it offers so many features in a small, portable package, it's the only PDA that can help me manage my practice from anywhere on the planet."

Graduate Student Manages Scholastic Life with Newton 2.0

As a graduate student at an Ivy League university, Todd Wilson has a hectic schedule, loads of work, and a tight budget. He has found a way to better manage his time and improve access to the information he needs by using a Newton PDA and Newton 2.0.

Improved handwriting recognition

Wilson cites Newton 2.0's handwriting recognition as the initial reason for his success with a Newton PDA.

"I'm astonished at how well Newton 2.0 lets me enter—quickly and accurately—odd combinations of letters and numbers. It has been invaluable to me in research work," he says.

At the library reference desk, for example, Wilson captures in checklist format all the reference numbers he needs, then marks them off one by one as he locates a book in a stack. "I don't have to worry about losing a piece of paper," he says. "And, I don't have to haul my laptop around to do what my Newton PDA does better."

Connectivity capabilities a plus

As a student living off campus, Wilson finds the connectivity capability in Newton 2.0 a huge benefit—especially the application Newton Press, which provides a one-step method for publishing reference information from his Macintosh computer to his Newton PDA; and Eudora Light for Newton, the e-mail communications software from QUALCOMM, Inc. He gathers the reference information using his Macintosh computer, which can connect to the library's on-line services. He saves the information as a text file on his desktop; drags the text file over the Newton Press icon where it's then saved as a Newton book; and loads it onto his Newton PDA via LocalTalk.

"Eudora Light for Newton...allows me to use my Newton PDA to read UNIX-based e-mail that has been retrieved from my university account by my desktop Macintosh. Now I can read—on the go—my e-mail from fellow students and professors."

Information Gathering in the Health Care Industry

ClinPen software

Medical Support Services (MSS) of Centerville, Alabama, in collaboration with Green Mountain Software Corp. of Colchester, Vermont, developed ClinPen, a Newton software package that gives home health care professionals a competitive advantage in patient tracking and billing procedures.

ClinPen is used by professionals in the home health care industry who carry a Newton PDA to record patient information in the home. Each health care professional uses ClinPen to record key information about the patient during a visit, such as vital signs, overall vital status, and clinical information. Mileage, reason for visit, and use of medical supplies are also recorded.

At the end of each day, the nurse uploads the day's patient information onto one of the satellite-office servers; from there, it's transmitted to the host system and is available as a printout. At the same time, the next day's visit schedules are downloaded and are available on the Newton PDA. The nurse also has the option of uploading information from home via modem.

Connectivity advantages provided by the Newton platform

Because the Newton platform has such rich network connectivity capabilities, it increases the productivity of home health care agencies. For every four nurses in the field, MSS can eliminate the need for one full-time person to enter patient information into the company's database. Moreover, patient records are now more accurate, and billing information can be obtained within 24 hours.

In addition, each patient's plan of care can now be tracked without requiring someone to physically examine the patient's chart. This is of tremendous value for agencies with branch offices; they now have the ability to verify the content of chart data either locally or remotely, via communications networks within a few minutes.

Police Department Records Crime-Scene Details on Newton PDAs

In the United Kingdom, one local police force is testing the possibility of supplementing the British police officer's traditional black book (used for collecting crime-scene data) with Newton PDAs. Specifically, the constabulary is investigating the use of Newton PDAs at crime scenes to record details of the incident and send them back immediately to the force's central computerized crime archive.

For each crime committed in the county, information is gathered and recorded in a database. Newton PDAs are used to eliminate any repetition of data entry from crime scene to the computer at the office; in effect, it acts as a mobile front-end to the crime data archive.

Productivity increases through electronic forms usage

The Derbyshire police force calculates that using Newton PDAs rather than paper could save an hour a day of a police officer's time, not just by eliminating the need to transfer

information, but because the mobile front-end prompts the user for all the details needed in connection with the particular crime. It does this via a series of pick lists: The police officer checks off items on the Newton PDA, ticking off relevant information that is coordinated with fields in the archive, and that corresponds to specific crime situations. For example, the pick lists are different if the police are investigating a burglary rather than a murder. Technological Business Solutions Ltd. developed the software, called Newton Crime Information System, and has also been developing similar systems for the fire brigade in Staffordshire and for ambulance crews in Philadelphia, Pennsylvania.

By uploading the information wirelessly, the police officers reduce their risk of making errors through multiple data-entry efforts, and can get information into the archives immediately.

Newton PDAs and the Food Service Industry

Salesforce automation

A \$25 million distribution company in Otsego, Michigan, Berne'a Food Service, Inc. specializes in refrigerated and frozen foods. With 90 employees, Berne'a distributes more than 300 products to about 3,000 grocery stores. The company sales representatives use Newton PDAs for communications, maintaining contact information and a calendar.

Newton PDAs are used by the Berne'a sales staff, 41 in total—six sales reps and 35 route sales reps. They use Newton PDAs to store client contact information and maintain their personal calendars. Besides this, they have also built a route sales automation system using Newton technology, to record and send invoice data, both wirelessly and with land-line modems.

Increased productivity through remote database access and electronic mail capability

Newton technology allows sales representatives in the field to perform their most critical tasks easily and in a time-efficient manner. Customer service benefits from quick, remote

data transfer. For example, once a sale is completed, customer account data is sent to one of the Berne'a servers for billing, via an e-mail client and RadioMail. Once an invoice is created, it is encoded in a mail message and sent through the Internet to the Berne'a QuickMail server. Then the message is read by their ACI 4D database, which sends a reply back to the Newton PDA from which the message was received.

Berne'a is also currently working on a similar query system in which the database will answer queries sent out to and from the field, such as inventory figures. Another facility the field force is making use of is a fax-back query, where a person in the field requests information be sent to an assigned fax number. All of these functions are made possible by the robust communications built into the Newton operating system.

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