NCR Takes to the Air with New Wireless LAN

One of the hottest areas in networking these days is wireless LANs. Getting rid of cables, which are expensive to purchase, install, and maintain, can reduce the cost of a LAN and make relocating employees vastly easier. But until now, the penalty for this increased flexibility and mobility has been lower network speed.

At next week's NetWorld show in Dallas, NCR will eliminate that penalty with the introduction of a new high-speed radio LAN that dramatically raises the stakes in the fledgling wireless market. The NCR WaveLAN, developed at an NCR facility in Holland, offers a throughput of 2 million bits per second — nine to 50 times faster than current competitors — and supports standard network protocols and operating systems. These features will make wireless LANs viable for file-sharing and e-mail applications, not just for printer sharing and file transfer, NCR says.

The WaveLAN uses a variant of IEEE 802.3 Ethernet (collision avoidance, not collision detection) and will initially run Novell NetWare 286, with support for other LAN operating systems planned in the future. By comparison, the O'Neil Communications LAWN uses a proprietary protocol and works at only 38.4 Kbps, while wireless offerings from Agilis and Telesystems work at 230.4 Kbps using Ethernet and Ethernet-like protocols, respectively.

Like the other players in the market, NCR uses spread spectrum technology, a secure radio transmission technique originally developed by the military for field communications. As its name implies, spread spectrum spreads out the radio signal over a large bandwidth and uses very low power, which makes it difficult to intercept or jam. WaveLAN uses the same 902 to 928 MHz band that has been allocated by the FCC to other wireless LAN makers.

The WaveLAN consists of a full-length AT- bus interface board that connects via coaxial cable to a 3-inch square external antenna. All the radio circuitry is on the plug-in card, which draws its power from the bus.

WaveLAN will sell for $1390 per node including NetWare drivers, or about two to three times more than an average Ethernet card. NCR acknowledges that the price is steep, but points out that costs for cabling typically run $300 to $1000 per node — and are incurred again every time you move.

In an unobstructed office space, any number of WaveLAN units (up to the limit of roughly 100 imposed by NetWare) can be installed within a radius of about 300 feet, or less if the signals have to pass through “soft” partitions of sheetrock or fabric. The signals won’t pass through metal or concrete walls, and for now you can’t intermix segments of cable and radio, as you can with the Photonics infrared LAN. But to connect across longer distances, such as between floors of a building, “gateway” PCs can be attached to both the WaveLAN and to a cable backbone network based on Ethernet, Token Ring, or Arnet.

Security and Moveability
One of the biggest questions about wireless LANs is their security against both accidental interference and deliberate jamming or eavesdropping. WaveLAN is inherently secure because it uses spread spectrum (which also means it will not interfere with other office equipment) and because NetWare employs network identifiers for data packets. As an extra measure of security, you can purchase a $90 Data Encryption Standard module that plugs into the interface board.

NCR is targeting the WaveLAN initially at customers who need to frequently move or reconfigure their networks, including short-term applications such as event management or crisis centers, and to people who have impediments against installing cable. But eventually the company hopes to widen the market to include customers who simply choose wireless over cable for cost savings.

One of the most important economics of the WaveLAN is in network maintenance, NCR says. The number one reliability problem for LANs is failures in cabling, which are eliminated in wireless networks. However, wireless LANs are currently lacking in standards, which means that each vendor’s hardware is proprietary and can’t communicate with any other radio LANs. (See sidebar.) One result of this situation is that no diagnostics or maintenance packages have been developed for wireless networks, nor are there high-level LAN management packages such as exist for cabled networks.

The WaveLAN will be sold only in the U.S. because it is the sole nation in which communications officials have authorized the use of a portion of the frequency spectrum for radio-based data communications. For the time being, all suppliers of spread spectrum LANs are using only the lowest of three authorized ranges.
Wireless LAN Standards Are Still Up In The Air

There is now an effort underway by the IEEE to establish a formal protocol standard for wireless networking, in which NCR is playing a major role. The standards committee will next meet in Canada in early September to discuss the protocol, now called 802.11. Its scope will encompass the physical/media and MAC layers of the protocol stack, since signal levels and encoding have to be standardized to achieve interoperability.

At one time, an IEEE working group had considered using the 802.4 token-passing bus protocol for wireless LANs, largely due to pressure from member General Motors, whose MAP (Manufacturing Automation Protocol) is a superset of 802.4. But according to Ces Li of NCR, the momentum has now shifted to a CSMA/CA (carrier sense multiple access/collision avoidance) scheme because "along the way, we realized that CSMA/CD could do it as well" and for a lot cheaper, using off-the-shelf Intel Ethernet controllers instead of the rarer and more expensive Token Bus chips. The standard is not expected to be defined for at least a year, after which it will have to pass through approval cycles.

Federal Communications TechNews, August 1990  Circulation: N/A

- NCR Corp. will unveil its spread-spectrum WaveLAN product at Networld '90 in Dallas Sept. 10. The Novell NetWare-compatible system claims a 2 MB/s transmission speed at 902-928 MHz. It consists of a board that fits inside ISA-compatible PCs, connected to an omni antenna in a separate case. List price is $1,390, plus $90 for optional DES encryption.
In a strong push to reign as king of the corporate airwaves, NCR Corp. plans to unveil its first wireless LAN at NetWorld 90 in Dallas next week.

NCR’s new WaveLAN offering—which comprises an AT adapter, a plug-in antenna and software—will let Novell NetWare users transmit data at speeds of up to 2M bps using radio frequencies instead of traditional coaxial or twisted-pair cabling, company officials said. Existing wireless networks from companies such as O’Neill Communications Inc., Telesystems SLW Inc. and Agilis Corp. transmit data at speeds ranging from 9,600 bps to 300K bps.

The $1,390 WaveLAN is aimed at retail, financial and other markets that require flexibility in installing a network and moving PCs around a site, said Scott Shafer, director of workstation products and product marketing for NCR in Dayton, Ohio.

Other potential candidates for WaveLAN include companies located in older buildings where it is difficult to install wiring, and in firms eyeing inexpensive ways to add PCs to their existing networks, he said.

“For financial houses like banks, it provides flexibility in providing communications for both small and big branches, and for older branches that have marble floors that make it hard to lay cable,” Shafer said.

The 16-bit WaveLAN board functions like a traditional Ethernet or Token-Ring adapter: It fits into an AT or compatible slot and works with DOS 3.0 and NetWare 2.1X to offer full LAN capabilities such as E-mail and peripheral and file sharing, officials said.

WaveLAN connects PCs within a diameter of 800 feet in an open-office environment; environments that encompass separate offices or have other barriers are limited to distances of 400 to 500 feet, said Cees Links, director of product management for NCR’s Systems Engineering Division in Holland. If greater distances between PCs are required, WaveLAN can be connected to higher-speed Token-Ring, Ethernet or ARCnet backbone networks, he said.

WaveLAN incorporates the Federal Communications Commission-approved spread-spectrum technology to help keep data transmission secure and reliable, Links said. This technology spreads the signal over a wide band of radio frequency, making it difficult to tap into the signal, he explained.

For additional security, NCR will offer an optional $90 chip for the WaveLAN board that incorporates the U.S. government’s Data Encryption Standard, Links said. The complete WaveLAN package will be available in volume by mid-November, Shafer said. NCR can be contacted at (513) 445-5000.
Vendor's entry into market lends it credibility, say competitors

NCR GOES WIRELESS

Although the technology behind wireless local area networks dates back to military communication between the Allies during World War II, the current problems of corporate wiring are now forcing companies to look again at the technology. Next week NCR Corp. will become the first major player to enter the growing market with its WaveLAN product. But even though the concept helped win the war, will users trust networks without wires?

The NCR WaveLAN can transmit data at 2 Mbits per second (Mbps) and is compatible with both MS-DOS and Novell Inc.'s NetWare. It works within an 800-foot diameter using the "spread spectrum" method of radio transmission, which the company claims is harder to intercept and interpret. Each network interface card and antenna costs $1,390; a data encryption security feature can be added for $90.

Dayton, Ohio-based NCR considers the cost a one-time investment; that's unlike cabling, which must be replaced every time a workstation is moved within an office. "With WaveLAN, every time a user makes a change in their network after the first time, they're doing it practically for free," says Cees Links, director of product management for NCR Systems Engineering B.V., the facility in Holland that worked on WaveLAN. NCR is targeting the financial, legal, retail, health care, government, and transportation industries.

Although at 2-Mbps WaveLAN offers the highest throughput of any competing wireless network offering, it is still not sturdy enough to handle complex network information flow, which at most major corporations is in the 4-Mbps realm.
The Institute of Electrical and Electronics Engineers (IEEE) 802 Committee on local area network (LAN) standards recently formed a working group to develop wireless LAN specs, and one of its first acts was to make its presence felt at the Federal Communications Commission. The 240,000-member IEEE says the P802.11P Working Group, which will hold its first meeting September 10-14 in Oshawa, Ontario, was spawned by current token-bus LAN standards. It expects to have a standards draft ready by mid-1991, defining how RF devices can exchange data and probably support speeds in the 1Mbps-20Mbps range for support datacom and limited voice among fixed, portable and slow-moving equipment. P802.11 is chaired by representatives of NCR Netherlands, which plans to introduce a spread-spectrum wireless LAN.

P802.11 initially is examining spread spectrum but it may also examine infrared and other light-wave technologies. Specifically, it is concerned with the three frequency bands (902-928MHz/2400-2483MHz/5725-5850MHz) for Industrial, Scientific and Medical (ISM) usages based on current Federal Communications Commission rules, i.e., Section 15.247 covering spread spectrum and low power, the area under which most wireless LANs are entering the market. The IEEE says datacom in ISM bands is unprotected from higher power transmitters, and Section 15.247 requires expensive features aimed at preventing interference with higher status users. Additionally, many other services are evolving under Section 15.247 and the ISM bands will over time have limited usefulness for datacom, according to IEEE. The FCC is altering various Section 15.247 rules, but the changes generally involve loosening technical constraints on coding, spectral density, gain, channel bandwidth and antennae.

P802.11 filed comments urging the FCC to expand its Notice of Inquiry (NoI) scope on new voice-oriented Personal Communications Services (PCS) to include data. Basing its position on the belief that "a significant market also exists" for high-speed wireless LANs, P802.11 advocated local datacom be included within the services covered by the NoI because for user groups, "the volume of usage and dollar value of the products produced for this market could very well exceed that for voice/telephone equipment. This volume could have a proportional impact on industrial efficiency."

The IEEE also maintained a protected band for datacom, possibly shared with power-density voice/telephone users and assigned primary users, is "badly needed." It indicated that RF spectrum be provisioned for radio LANs with signaling rates of at least 1Mbps and up to 10Mbps. The 1700-2300MHz frequency region mentioned in the NoI is highly desirable, although higher frequencies are usable. The IEEE believes either the 1850-1990MHz, 1990-2110MHz or 2110-2200MHz bands could be allocated for wireless LAN datacom on a shared basis with current usage allocations. IEEE 802 maintains that high signal rate LAN equipment is an efficient use of radio spectrum, not only because of the short distance aspect, but also because IEEE 802 LAN protocols use LAN packet technology. As an outgrowth of that technology, transmitter on-time is likely to be only a few milliseconds per message resulting in a high time-shared capacity for each communication channel.
NCR unveils high-speed Wireless LAN

NCR today became the first major vendor to announce a high-speed wireless local area network (LAN) interface card, which eliminates the need for wiring to connect personal computers in office settings.

Called NCR WaveLAN, it is the first of a family of NCR wireless products and transmits data at two million bits per second (Mbs), more than nine times faster than any other wireless LAN currently available. It is compatible with Novell Netware and features "spread-spectrum frequency technology," which provides highly reliable and secure data transmission without interference or interception. Upcoming release plans include Micro Channel Architecture, high-speed products, and additional driver support including Network Driver Interface Specification (NDIS), Net BIOS, LAN Manager, and Novell 386.

NCR WaveLAN is designed for businesses wanting flexibility in the location and movement of PCs and LANs. WaveLAN is easier to install than traditional wired LANs because it doesn’t require cabling. Many businesses face high costs or barriers to installing LAN cabling.

"WaveLAN, developed at SE-Utrecht, is the first product in the implementation of our vision of wireless computing -- bringing computing power to all places, wherever and whenever people want. It is also another step in the realization of our company’s strategy toward helping customers manage change," said Khaled Marro, vice president, Financial Systems Division.

The product consists of a single printed-circuit board, which fits into the expansion slot of a PC/AT or compatible system, connected to an omni-directional antenna housed in a three-inch-square case. The antenna is mounted nearby, such as on the PC cabinet, a wall, or office partition.

Any number of PCs can be part of a WaveLAN installation within a maximum radius of 1,000 feet in an open office setting, depending on the office environment. Transmission is not blocked by office partitions or normal office construction (with the exception of thick concrete or metal).

WaveLAN networks can be connected over longer distances or tied to other networks by having one of the PCs on the WaveLAN network also connected to a wired "backbone" network. Because WaveLAN supports the same standards as wired LANs, file transfers or other requests can be accomplished transparently between the wireless and wired LANs.

"NCR is setting new standards for wireless networks and is capable of delivering this new technology to the many NetWare users that are also NCR customers in industry, government, and academia," said Alan Rudd, vice president, OEM Sales, Novell. "The WaveLAN Technology reinforces Novell's and NCR's commitment to freedom of choice at the desktop. By bringing together leaders in network computing and wireless local area network technology, we will create a new class of NetWare configuration flexibility for NetWare customers that previously did not exist. Many NetWare users can benefit from WaveLAN by not having to run network cabling everytime they move an office."
LANs Go Wireless with Technology Advances

Spread-spectrum technology from vendors such as NCR, Telesystems, and Agilis solve challenging cabling problems

BY PATRICK DRYDEN

Networking by spread-spectrum radio technology has solved some vexing wiring problems in environments ranging from noisy factory floors to sensitive hospitals to high-security government and financial offices.

Recently, network managers for some electronics manufacturing companies (which prefers to remain nameless, since it manufactures Ethernet cards) gave up on the cumbersome cable segment. Even shielded thick Ethernet suffered interference due to arcs from soldering machines on the plant floor. After trying a radio LAN adapter, they went wireless. Most LAN planners don't encounter such connectivity challenges. But even in normal office networks, continually rising installation and relocation costs—estimated at $1 billion yearly—can inspire dreams of wireless links.

So far, the slow transmission rate and high cost of radio LAN adapters have limited the emerging technology to niche markets and specific solutions. But a wave of recent announcements from wireless-LAN companies indicates that radio LAN technology is here to stay.

R Corp. hopes to counter the modems-speed complaints when it begins sampling WaveLAN this month: Portable-termina

nal maker Agilis Corp. set a new course for wireless networking with special-purpose units offering Windows and touch-screen interfaces; and data-radio pioneer Telesystems SLW Inc. and original equipment manufacturer (OEM) Proxim Inc. just shrunk their transceiver components, targeting portability as a bigger market than cable replacement.

Some vendors see radio-equipped PCs as the next big connectivity craze—the cellular telephones of corporate networking. Users of laptop and smaller systems might soon keep files and E-mail access as they move among cubicles or meeting rooms. And Agilis is currently developing a wireless transmission for the Chicago Board of Trade.

As for radio's expense, a growing market means volume and competition that lower prices. And despite the growth in wiring jobs, labor costs remain high.

SPREADING DATA. Interest in joining standard communications networks through wireless technologies led the IEEE 802 committee this summer to create a new working group, 802.11.

Providing members met for the first time last month in Ontario. Acting chairman of 802.11 is Vic Haynes of NCR Systems Engineering B.V. (For more information on the group, contact him at Zadelstede 1-10, 3431 ZJ Nieuweveen, Holland or Don Johnson of NCR Corp. at 1700 Patterson Blvd., Dayton, Ohio, 45479.)

Members of IEEE 802.11 will propose standards for wireless LANs. While some new networking techniques involve infrared, microwave, and other links, a key focus will be utilization of radio waves that have been opened up for unrestricted commercial use.

The Federal Communications Commission approved three bands of frequencies in 1985 for industrial, scientific, and medical data communication. These span 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz in the radio spectrum.

The NCR, Telesystems, and Agilis products spread data transmissions across the lower bands of these frequencies. The covert signal links beneath the noise level instead of rising above it in one strong signal that would require a frequency license (see figure 1).

The spread-spectrum approach originated during World War II as a way for military communications to avoid interception and jamming. Proponents say it can ship data faster than fixed-frequency radio and that only authorized spread-spectrum receivers can decipher such transmission from more noise.

On the network battlefield, spread-spectrum transmission can help defeat such eavesdroppers or such interference sources as elevator motors and factory machinery. Backers say spread-spectrum signals resist other wireless data transmissions and don't affect sensitive equipment, such as that found in a hospital, airport, or lab environment.

CALLING ALL STATIONS. Wireless radio connects local and area workgroups within the radius of the omnidirectional antenna.

NCR, of Dayton, Ohio, provides 3.5-inch-square antennas for each WaveLAN adapter that sits atop the PC case or mounts on a wall or office partition. Telesystems, of Don Mills, Ontario, puts a 3-inch monopole antenna on the bracket of each ARLAN 400 series adapter. (Telesystems and others also offer radio modems and transceivers for asynchronous terminal communications with host systems.)

All similarly equipped stations in range of the broadcast server send and receive network transmissions, so they need arbitration to avoid communications anarchy.

Both vendors use a carrier sense multiple access with collision avoidance (CSMA/CA) scheme similar to Ethernet, and both process the strongest signal first. Also, additional algorithms help prevent channel hogging by closer stations.

Signal strength and LAN configuration prevent signal mixups among multiple ARLAN servers in the same building, said Wenceslau Zeno, Telesystems' president. "It's tricky to set up, but we run several LANs within our office. Logging in to someone else's server upstairs or on the other side of the wall just doesn't happen," Zeno said.

NCR adds network identification to its transmission protocol so that users can operate multiple WaveLAN networks within range of each other, said Coos Links, director of product management for NCR Systems Engineering in Holland. ARLAN can cover more territory at 300 kbps, but WaveLAN blast away at 2 Mbps, nearly as fast as cable ARCNET.

According to the vendors' spec sheets, ARLAN covers an open area as large as 3,000 feet in diameter, while WaveLAN covers 1,600 feet. That's a wide-open space like a factory floor, not a warehouse with intervening shelves and stacked goods (unless, for example, both server and station remain in clear sight along a corridor).

In a typical office environment with partitions and normal construction, ARLAN claims a diameter of 300 feet, compared to a minimum of 200 feet for WaveLAN.

Transmissions won't penetrate thick concrete or metal walls, but careful station placement can enable reception around corners, vendors say.

Of course, standard Ethernet, token-ring, ARCNET, and other cabling can act as a backbone to join radio-equipped work...
groups. Telesystems is sampling an Ethernet cable-attached transceiver for broadcasting to stations within range of a wire run.

Another tradeoff in coverage versus transmission rate may involve a signal's resistance to interference and fading. Telesystems claims more robust and secure transmission through the redundancy of a larger spread ratio—90 to 100 degrees compared to the 10 to 15 degrees of other LAN and terminal products, Zenko said.

Radio LANs can link across campus environments, too. Telesystems offers a directional antenna for line-of-sight radio links up to 6 miles. In January, NCR will offer a similar 5-mile option, said Scott Schafer, NCR's director of workstation products marketing.

Both the AT-Bus ARLAN and the NCR WaveLAN currently support Novell NetWare 386. Telesystems recently added drivers for NetWare 386, Zenko said. NCR has announced it expects support for NetWare 386, LAN Manager, and NetBIOS by the end of the year or by first quarter 1991.

As always, new network technology carries a hefty price tag. The AT-Bus ARLAN costs $1,500, while NCR introduced its WaveLAN for $1,390.

PORTABLE FUTURE. While spread-spectrum radio adapters can solve wiring problems in old buildings, noisy environments, and high-security applications, they won't replace common cabling at this price.

"With Ethernet cards down as low as $80 at Networld this year, who in their right mind would switch everybody to radio cards costing well over $1,000?" asked Steve Magidson, marketing vice president of Xircom Inc., of Woodland Hills, Calif. Xircom sees far more potential in augmenting its line of pocket-sized LAN adapters with a model for peripatetic users.

Such a transceiver would clip onto any laptop or notebook PC that users could tote to meetings and anywhere within office radio range. These roamers would be able to check group calendars and project schedules, send and receive E-mail, and tap gateways to other resources throughout the corporate network.

Telesystems recently integrated its radio components onto a 2.5-inch-square module with a power draw low enough for battery operation. Zenko said OEMs want the module for hand-held inventory and other counters, portable point-of-sale terminals, and notepad devices that accept written input.

Proxim Inc. of Mountain View, Calif., is working with PC, laptop, and connectivity OEMs who seek portable LAN links based on its device, which measures 2.2 by 3.75 inches, said Mike Sullivan, Proxim's sales vice president. Proxim offers its radio component as low as $150 in original equipment manufacturer quantities.

"Mobility offers the most significant potential for spread-spectrum radio," Sullivan said. "Developing for specific wire-free vertical markets and general desktop adapter replacement wasn't worth the effort. Now the portability angle makes it worthwhile."

Telesystems' Zenko expects ARLAN prices to decline, following the pattern of product evolution. "The price of electronics just keeps dropping, but the labor cost for cable handling always goes up."
The Executive Computer/Peter H. Lewis

NCR Introduces Its Version of a Network Without Wires

It's easy to set up, but too slow for some uses and the relative cost is in dispute.

SHORTLY before the opening of the Network computer conference here earlier this month, a forklift snagged on a bundle of cables that linked computers on one floor of the exhibit with those on another floor. As a result, a model network that was to have been a showcase for Network's 30,000 visitors was partly knocked out. Simplifiers and tech-simplifiers are nothing new to network administrators, but losing a network at the country's premiere network show was bad luck indeed for the handful of companies that were showing off the system. The accident, however, left the people at the NCR Corporation's exhibit smiling.

NCR, of Dayton, Ohio, the country's fifth-largest maker of computers, was demonstrating a wireless network system called Wavelan. The system is a no-standard AT-class computer by a wireless technology called spread-spectrum radio transmission, which works with the DOS and Novell networks 268 operating systems, allowing computer users to transfer files, programs, electronic mail, laser printers and other common office-computer resources.

NCR officials said computer files could be transferred over its spread-spectrum network almost 10 times faster than other wireless networks, which rely on infrared light. Still, the NCR system, which can transfer 2 megabits of data a second, is not fast enough for some network applications, like sending and receiving large graphics files. In those cases, a wired network like Ethernet or Token Ring, capable of transferring data at 4 million to 16 million bits a second, is required.

A Wavelan personal computer has an omnidirectional antenna, which like a three-inch-square rudder, attaches to a card that plugs into any standard AT-type PC slot. Because there are no wires, a Wavelan-connected PC can be moved from one office to the next with no significant effect on the network. Most networked PCs, by contrast, have cables or wires attached to their network cards.

Wireless networks are attracting a great deal of interest, especially from companies that are growing rapidly or that have to reconfigure office designs frequently. They might be thought of as "instant" networks, because they can be set up literally overnight with a simple connection.

That is a sharp contrast to conventional wired networks, where adding a work station or moving a worker to a different office can create headaches. Older buildings, not designed for the electronic age, often have cables snaking under floors, behind walls or through air ducts. Any changes in the wiring can create a logistical monster. Even in newer buildings, with structured wiring schemes, adding or moving a computer user is seldom a trivial operation.

The spread-spectrum transmission used by Wavelan is not new; it was developed during World War II to prevent the enemy from jamming or eavesdropping on Allied radio transmissions, and it is essentially forklift proof. It is also impermeable to construction crews that might accidentally saw through the wiring place in the office wall.

In a spread-spectrum network, data travel through the air, not through the coaxial cables or wires that connect most networked PC's today. Also, the radio signals can travel through office partitions and short-rock walls (though not through concrete or steel). It is this ability to pass through typical office partitions and walls that gives spread-spectrum an advantage over the other main type of wireless network, in infrared networks, computers beam information to one another along direct, focused paths of light. If any object blocks the line of sight between computers, the signal is interrupted and data can be lost. At least one company, Photonics Inc. of Campbell, Calif., has sidestepped this problem by aiming the infrared beams at relay stations placed on office ceilings, lessening the risk that someone walking past will cut the data flow.

Impractical, or where temporary networks are needed, as in the case of a team of reporters covering a convention or a team of auditors working at the client's site, he said.

"In companies where there is a lot of reconfiguration, or some limitation on cabling, there is little doubt about Wavelan's usefulness."

CONTINUE
man said. (One computer with a card for a wireless network and a card for a wired network could link the two systems.) "But it's expensive, at $1,370 per machine," he said. "These days I can get a production-level Ethernet card for about $250, and wiring is often no more than $120 per run."

NCR officials, citing data provided by other market researchers, insisted that the costs of conventional wiring were actually much higher, ranging from $500 to $1,500 for each computer on a network. High labor costs involved account for the most expense, Mr. Links said.

NCR officials, noting spread-spectrum's counterespionage origins, said data security on Wavelan was actually superior to that on a wired system. Spread-spectrum broadcasts are low-power signals across a broad band of frequencies from 902 to 928 megahertz. Only authorized users that know the "spreading pattern" of the frequencies and how to unspread it can listen in.

NCR also gives each Wavelan network its own identifying characteristics, so two Wavelan networks can operate in the same area without interfering with one another. The network is immune to interference from radios, cellular phones or other communications devices — but not from some military radar.

Mr. Links said if the network were adjacent to a military base, some interference might result.

Although the network is essentially a broadcast station, the Federal Communications Commission does not require a broadcast license for spread-spectrum operations. Khaled Marrei, vice president of NCR's financial systems division, said the company was working with the FCC and international regulatory agencies to explore the possibility of increasing the power and frequency available for spread-spectrum.
Wireless computers signal savings

By John Schneidawind
USA TODAY

The cordless phone did away with wires for telephones. Now a growing number of companies say they can make office computers cordless, No strings attached.

And with good reason. Each year, 52% of companies move at least part of their operations.

That means ripping out and relaying miles of costly computer cable through ceiling ducts and floors.

Ugh.

Corporations pay anywhere from $500 to $1,500 to wire a single personal computer to a network of other PCs to let them share information. Those cabling costs are paid each time companies move operations.

But the new wireless technologies, which include sending data via infrared light, lasers or radio waves, promise to shave connection costs to as low as $200 to $300 per PC. And once you go wireless, there's never any new cabling costs to, ahem, tangle with.

Among the companies charging into the wireless computer market:

► NCR Corp. The Dayton, Ohio, maker of minicomputers earlier this month unveiled a wireless personal computer device that plugs into PCs and uses radio waves to send data at 2 million bits a second — more than nine times faster than any other wireless computer network. PCs can be up to 1,000 feet apart, and data can be sent through walls. Cost: $1,300 to outfit each PC with card and antenna. But NCR officials say that's cheap compared to moving cables, which costs about $750 each time you move. For an extra $90, you can encode your computer data against eavesdropping.

► Photonics Inc. The Campbell, Calif., company uses infrared light to send data between PCs in an office, using the same technology as a television's remote control. Photonics, backed by Apple Computer, says it costs only $300 to add a computer to Photonics' system, which sends data back and forth between PCs by bouncing it off the ceiling.

► Laser Communications Inc. The Lancaster, Pa., company uses laser beams to send data back and forth between wired networks of computers. Normally, telephone lines send computer data between buildings, but at just 1.5 million bits a second. Laser Communications' devices use lasers to send data at up to 16 million bits a second. The system costs between $14,000 and $35,000, depending on how much computer data you send.

► VeriFone Inc. The Redwood City, Calif., company also uses radio waves to replace wired computer networks used to verify credit cards. VeriFone's TRANZceiver terminal replaces units that are wired to computer cables in department stores and supermarkets.

TRANZceivers, which cost $300 to $800 apiece, call up the verification center through the outside telephone network.

The company says the technology also could process health claims instantly at a doctor's office or provide an instant debit from a checking or food-stamp account.

But the wireless office is not without problems. Chief among them:

► There is a growing shortage of radio channels. That could force companies with cordless computers to share radio space with other users, which could result in interference and the loss of valuable computer information.

► Like the signals from TV remote controls, infrared light won't go through people.

You talk, new VCR responds

Special for USA TODAY

Matsushita Electric Industrial Co. of Japan says it has developed a home videocassette recorder that can tell you how to program it, then listen and respond to your spoken instructions.

Matsushita, which makes electronic products under the Panasonic, Technics and Quasar brands, will display the VCR Oct. 26 in Tokyo at the Japan Electronics Show '90. Marketing plans and pricing haven't been announced.

The talking VCR was developed in response to growing consumer demand for simplified VCR programming. Matsushita has said its machine also will be able to recognize spoken commands from a speaker whose speech pattern hasn't been preregistered.

The programming process starts with a synthesized voice instruction from the remote control. The user responds with a voice command. The interaction continues through channel selection, day of the week and starting and ending times. The program is verified by the VCR's visual display.