

contrast, GAP services an elite corps of frequent air travelers consisting primarily of business executives and professionals. A. D. Little Study at 21.

To the extent that PacTel wants to serve this niche market, there are alternative ways to do so that are more spectrally efficient. One alternative is to incorporate a GAP service into an existing terrestrial-based nationwide paging operation. Another alternative would be to provide this service as part of the existing Air-Ground allocations in the 849/894 MHz bands. Given the variety of ways to provide a GAP-type service and the limited number of projected users, GAP satisfies no immediate, unmet need. Thus, the Commission should deny PacTel's request for a Pioneer's Preference for the GAP service.

IV. CONCLUSION

None of the captioned requests for Pioneer's Preferences propose a service which is innovative, and for which there is an immediate need for deployment that can be accomplished in both a cost effective and spectrally efficient manner. Consequently, none merit the award of a Pioneer's Preference.

WHEREFORE, PageNet respectfully requests that the Requests for Pioneer's Preference filed by Dial Page, L.P., Echo Group,

L.P., Mobile Telecommunication Technologies Corporation, PacTel
Paging (Advanced Architecture Paging), PacTel Paging (Ground-to-
Air Paging) and PageMart, Inc. be denied.

Respectfully submitted,

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APPENDIX 1

LEVEL 1 - 1 OF 2 STORIES

Copyright 1992 Network World, Inc.
Network World

April 6, 1992

SECTION: INTERNATIONAL NETWORKS; Pg. 1

LENGTH: 1108 words

HEADLINE: Emerging wireless services promise to set workers free

BYLINE: By Wayne Eckerson, Senior Editor

BODY:

With demand for wireless data services heating up, a score of vendors with competing technologies are vying for shares of what they see as a huge, virtually untapped market.

Companies are building or planning networks employing everything from low-flying satellites to cellular technologies for supporting mobile workers and computers outfitted with radio modems.

Last week, for example, a consortium of cellular carriers announced plans to explore high-speed data communications services. And last month, the World Administrative Radio Conference (WARC) '92 set aside radio frequencies to support a host of new wireless services ("Int'l decisions reached on allocating radio spectrum," NW, March 9).

Ira Brodsky, president of Datacomm Research Co. in Wilmette, Ill., which specializes in wireless technologies, projects that revenues for wide-area wireless data services will hit \$145 million this year and almost triple to \$427 million by 1995.

Jack Blumenstein, president and chief executive officer of ARDIS Co., which runs ARDISNET -- the nation's largest mobile data net in service today -- said there are at least 50,000 firms with between 25 and 50 field service representatives that could benefit from ARDISNET-like services. But that is just a fraction of the 45 million mobile workers he contends are potential subscribers to wireless data services.

Brodsky said the growth of wireless data services will be fueled by demand for two-way wireless electronic mail, which is expected to take off when manufacturers incorporate radio modems directly into palmtop and notebook computers.

Many large companies are already reaping considerable benefits from wireless services. Pitney Bowes, Inc., for example, last year outfitted 2,500 field service technicians with hand-held computers containing built-in radio modems. Technicians log on to the company's host computer via ARDISNET to find pending assignments, check availability of parts in inventory, log completed assignments and message other technicians.

The service has enabled Pitney Bowes to consolidate 16 dispatch centers into six and reduce the number of dispatchers by 40%, according to Archil Martin, vice-president of customer service at the firm.

Network World, April 6, 1992

Leader of the pack

More than a dozen companies, including such giants as The Coca-Cola Co., Otis Elevator Co. and United Parcel Service, Inc., are now using ARDISNET to support mobile workers. To keep up with demand for expanded coverage, ARDIS is building one new transmitter every week, Blumenstein said.

ARDIS, which is jointly owned by Motorola, Inc. and IBM, uses a network Motorola built in the early 1980s to support IBM's field technicians. It began offering commercial service in 1990 and now covers 400 metropolitan areas.

Customers use terminals with built-in radio data modems to send and receive packetized data from nearby radio towers, which are connected in a terrestrial network. Companies link their host computers to the terrestrial net via dedicated leased lines or a value-added network, giving mobile workers immediate access to host applications.

However, ARDIS is not the only player in the field. Its biggest competitor is RAM Mobile Data, a joint venture between BellSouth Enterprises, Inc. and RAM Broadcasting Corp., which began offering wireless data service last year and now operates in 25 U.S. cities.

RAM's network, called Mobitex, offers several advantages over ARDIS that may allow it to close the gap on the front-runner. Mobitex is a trunked or specialized radio system, which means that subscribers contend for a pool of 10 to 30 radio channels, giving the system ample capacity in crowded urban areas. In contrast, ARDIS is a shared mobile radio system that transmits on a single radio channel.

RAM's network, which offers data throughput of 8K bit/sec, also has a roaming feature that tracks the location of subscribers when they move between service areas. Blumenstein said ARDIS is adding roaming features and additional channels to its network and will boost bandwidth from 4.8K to 19.2K bit/sec by year end.

Bandwidth is a problem for all mobile radio services. Because radio waves are prone to interference, more than half the available bandwidth is consumed by error checking, Brodsky said. When ARDIS boosts bandwidth to 19.2K bit/sec, for example, it will actually support throughput of only 9.6K bit/sec.

The cellular contenders

Despite ARDIS' and RAM's head start, many cellular service providers believe they are in the best position to capitalize on the growing demand for wireless data services because of their large installed networks. Few subscribers transmit data across cellular nets today because the services are expensive, prone to interference and lose data when subscribers move from one cell site to another.

Many cellular firms are planning to upgrade their nets to handle data better. McCaw Cellular Communications, Inc., the largest U.S. cellular provider, is expected to unveil soon a new method for supporting data. Without giving many details, a company spokesman said the new system will support high data transmission rates and be more reliable and secure than current cellular technology.

Paging companies are also moving into the act. Most of them have announced one-way messaging services that allow subscribers to receive and store short incoming messages. They can also notify the sender that the messages were received, a limited form of two-way messaging.

Motorola just launched an enhanced one-way messaging service called Electronic Mail Broadcast to a Roaming Computer (EMBARC), which will be rolled out in 70 cities during the next few months. With EMBARC, subscribers can receive and store messages from business colleagues or third-party information service providers in a 10-ounce pager-like device. They can then download the data via an RS-232 port into a portable computer.

Satellite providers also hope to jump into the fray. The agreements hammered out at WARC '92 immediately boosted the fortunes of low-earth orbit (LEO) service providers, such as Orbital Communications Corp. Orbital plans to deploy LEO service that will enable travelers to use a low-cost, pocket-sized device that can send and receive E-mail messages anywhere in the world. The company plans to deploy service in the Western Hemisphere next year and worldwide by 1994, a company spokeswoman said.

As for personal communications services, more than 150 companies have applied to the Federal Communications Commission for licenses to experiment with the technology, and many plan to offer data communications services.

Information Processing

TELECOMMUNICATIONS



TRACKING ADJUSTMENT: A WIRELESS NETWORK KEEPS INVENTORY AT MAERSK'S CARGO YARD

WIRELESS NETS AREN'T JUST FOR BIG FISH ANYMORE

The telecom giants aim to sell mail and data services to the masses

Frederick W. Smith became a business legend by creating the overnight package-delivery industry with Federal Express Corp. He did it by assembling his own airline and guaranteeing that your package would arrive at its destination the next morning, no matter what. But less known is the critical role that telecommunications technology has played in keeping the \$7.7 billion company the dominant force in its market. Back in 1977, FedEx began building a radio-based communications network that eventually tied all its offices, planes, and couriers to the company's

computers in Memphis. That lets FedEx trace any package from the moment it's picked up at a customer's office to when it's delivered.

Until recently, the only way to get the kind of network that FedEx runs was to build it yourself—at a cost of hundreds of millions of dollars and years of development. But now there's an alternative. Everybody from cellular phone companies such as GTE Mobilnet to IBM, Motorola, and Swedish giant Ericsson is trying to bring wireless networks to the masses. Two new systems—Ardis and Ram—are already up and running.

These networks are relaying electronic mail to traveling executives and exchanging information with field-service technicians, insurance-claims adjusters, and other on-the-move workers. Early customers include ADP, National Car Rental, and ICL Retail Systems. The payoff, as at FedEx, is improved customer satisfaction, higher productivity, and greater operating efficiency.

TIMESAVER. Take Maersk Inc., the Danish shipping company. It sometimes misplaced containers in its huge U. S. shipyards, leading to delays in delivering cargo to customers. Now, Maersk cargo-yard operators in Newark, N. J., and Charleston, S. C., relay container reports to a data base using wireless terminals. That saves about two hours a day of workers' time. "It gives you a competitive edge," says Maersk Telecommunications Director Tivadar Macskassy.

The mobile data business is a major part of an even bigger market for all kinds of wireless data communications, including office computer networks that use airwaves instead of wires. This year, sales of all kinds of wireless data equipment will reach \$450 million, while revenues from wireless data services will hit \$160 million, estimates Ira Brodsky, president of Datacomm Research Co., a market researcher. Within 10 years, equipment sales could more than quintuple, to \$2.5 billion, and services could surge to nearly \$1 billion, he estimates.

Meanwhile, communications companies are modifying existing networks for wireless data. Cellular carriers such as McCaw Cellular Communications Inc. are pursuing a variety of technologies to boost data traffic over their voice systems (box). Specialized mobile radio (SMR) networks that have been used to dispatch fleets of taxis are now being fitted for data communications. Paging services are also getting in on the act. SkyTel Corp. last September began the first national service that delivers text and data to pagers. Motorola Inc., the world's leading maker of pagers, is rolling out a service called EMBARC that will

FOUR WAYS TO MOVE DATA THROUGH THE AIR

WIRELESS DATA NETWORKS

TECHNOLOGY Radio-frequency networks for data only

USE For mobile workers who need to communicate frequently with a corporate data base

SUPPLIERS Ardis, Ram Mobile Data

FLEET DISPATCH SYSTEMS

▶ Share voice network that dispatches taxis, vans, etc.

▶ For companies that need mobile data service but don't require national coverage

▶ Motorola, Racotek, Fleet Call

CELLULAR PHONE NETWORKS

▶ Data is carried over cellular channels

▶ For mobile workers who need to send occasional long files

▶ Any cellular operator

PAGING

▶ Advanced pagers that handle both numbers and letters

▶ Primarily for one-way transmission of electronic mail and bulletins to people in the field

▶ Motorola, SkyTel, BellSouth

DATA: DATACOMM RESEARCH CO., INC.

connect palmtop, notebook, and laptop computers via paging channels.

But Ardis and Ram, designed specifically for data, seem to have the edge over services that piggyback existing wireless networks. Both use the packet-switching technology that telephone-based data networks use. Packet switching encapsulates data in "envelopes," which ensures that information arrives intact. Paging systems, SMRS, and cellular networks don't yet have packet-switching, which makes sending data on them more cumbersome.

Ardis Inc., which is jointly owned by IBM and Motorola, began offering wireless data services in April, 1990, over a network designed by Motorola in the mid-1980s for IBM field technicians. In 1989, Ericsson teamed up with New York-based Ram Broadcasting Inc. to develop a competing system using Ericsson equipment. BellSouth Corp. bought a 49.9% stake in Ram Mobile Data for \$300 million this January.

Despite high costs for the hardware—terminals run as high as \$2,000 and radio modems about \$1,700—the companies are signing dozens of customers. Ram says its customers spend \$70 to \$100 a month per terminal, while Ardis says its customers average \$90 to \$120. Companies such as National Car Rental System Inc. say it's worth it. National uses Ram to manage its huge inventory of cars. Workers with handheld terminals prowling vast lots, recording the location of cars and the latest scratches and dings. Now the company can check customers' claims that a car was already damaged and find out quickly when one has been stolen. The big payoff: Moving cars in and out faster should boost utilization by 2% and each percentage point means more than \$1 million in savings, says Chief Information Officer John Livingston.

A MYTH. As archrivals, Ardis and Ram devote nearly as much energy to knocking each other as to promoting the concept of wireless networking. Ram says its system will be able to handle more traffic than the Ardis network because it has more radio channels. Ardis President Jack W. Blumenstein fumes: "The myth that we have a capacity problem is just that." He says that with new digital technology, Ardis can meet all its capacity needs through the year 2000. Ram also claims its system is more open to innovation because it is encouraging other companies to build radio modems for use on the network. Ardis, on the other hand, requires customers to buy Motorola modems. That policy is a big reason that Hewlett-Packard Co. isn't working with Ardis, says Clain Anderson, HP's program manager of communications products. HP is interested in selling its 95LX palmtop computer as a wireless

data terminal. Ardis says it's watching to see if its policy is a deterrent.

At this point, Ardis is by far the leader. Its service is available in 400 metropolitan areas, vs. 30 for Ram. While Ram promises to expand to 100 cities by yearend, Ardis is using its nearly blanket coverage to sign up customers now. While only a few hundred people now use Ram, Ardis provides service to nearly 20,000 workers at such companies as Pitney Bowes, NCR, and ICL. Then there

are 20,000 IBM technicians who continue to use Ardis.

But the race is far from over. New players and new technologies are entering the market all the time. What is clear is that wireless data services are here to stay. The era when companies could give employees a pocketful of change and tell them to call in from the nearest pay phone is gone forever.

By Lois Therrien in Chicago, with Chuck Hawkins in Atlanta

CELLULAR: IT'S STILL A BUMPY HIGHWAY FOR DATA

A few years ago, it took Co-Op Building Consultants 10 days to assess fire or hurricane damage and get the paperwork to an insurer. Now, equipped with cellular phones, consultants at the risk-management firm based in Corpus Christi, Tex., fill out an estimate on a laptop, wing it via cellular to headquarters for approval, and hand over a faxed copy to the insurance adjuster—all in 90 minutes.

IS CELLULAR BETTER YET?

- P** ▶ Cellular phones work like regular phones
- R** ▶ The cellular network is ubiquitous and more versatile
- O** ▶ Cellular is less expensive for sending long files of data
- C** ▶ Current technology using modems is clumsy, expensive, and unreliable
- O** ▶ Nationwide coverage requires dealing with many cellular companies
- N** ▶ Calls take a long time to set up, raising costs for short messages

DATA: EW

Says Co-Op President Clay Page: "We can handle about 60% more work with the same number of people."

Satisfied as Page is, he's part of a tiny minority of cellular customers—about 5%—who use their wireless phones to transmit data. Why so few? Carriers have been too busy building networks, signing voice customers, and paying off debt to promote data services. And because today's cellular nets are designed for voice, they have some disadvantages.

But that's about to change. As wireless data networks such as Ardis and

Ram come on strong, cellular operators want a piece of a market that may be theirs to lose. No. 1 carrier McCaw Cellular Communications Inc. says it will unveil plans for data services next month. Says PacTel Cellular President Susan Swenson: "We've got a highway out there, and we'd like to put more cars on it."

CALLING THE COPS. Cellular players are betting on heavy traffic. By 2000, nearly 13 million users of mobile data terminals will spend about \$50 a month each on cellular network calls, predicts Michael McLaughlin, a consultant with Booz Allen & Hamilton Inc. Moreover, adding data traffic could bolster cellular profits, since carriers wouldn't have to install much new gear.

Portable computers and data terminals wouldn't be the only market, either. Vending machines could use cellular to automatically send data to computers at headquarters, and alarm systems could call the police.

But cellular carriers have a lot to do first. Today, noisy cellular lines often scramble data. Data also can be lost when a caller moves from one cellular relay station to another. And cellular costs more on brief calls: That can triple the cost of a typical 10-second data message.

Still, cellular has advantages: It already covers hundreds of cities. And new technologies soon may fix many of its problems. Some carriers are planning this year to add packet networks similar to those of Ardis and Ram. That would eliminate the hassle of programming modems and allow the same instant connections, cutting transmission costs.

The biggest boost may come this year as carriers begin to replace their analog networks with equipment using the same digital language as computers. That will improve reliability and speed transmissions. It also will triple capacity, leaving more room for data.

But for now, it's uncertain how many customers will wait for the improvements. Unless cellular carriers ease the path for data, they may find customers taking another highway.

By Robert D. Hof in San Francisco

CERTIFICATE OF SERVICE

I, Lynn E. Shapiro, certify that on this 1st day of June, 1992, a true copy of the foregoing OPPOSITION TO PIONEER PREFERENCE REQUESTS was sent via first class mail to the following:

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