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Across the nation, as our highways become more crowded, and the demands of family life increasingly intermingle with those of the business place, the growing response of both employees and corporations has been to search for intelligent ways to begin working productively at home.

Working at home, or telecommuting as it's often called, offers advantages to everyone:

- ◆ *For employees*, the idea of telecommuting makes possible a better balance to home and work responsibilities. It can drastically reduce the time spent commuting during a typical week, and – in an amazing preponderance of early programs – has often resulted in more time actually spent working, plus lower stress and improved morale.
- ◆ *For employers*, telecommuting has shown that it offers not only happier, more loyal employees, but significant savings as well. It can reduce hiring and turnover costs, cut workplace expenses, and make it easier to extend business hours into the evening and weekend. It can also help answer seasonal needs for extra staff – and do it without adding space.

Perhaps most importantly, however, is that early programs have shown consistently improved productivity, and happier,

more loyal workers. Telecommuting also offers an answer to growing environmental movements, such as the Clean Air Act of 1994, to reduce traffic congestion and pollution, as well as social mandates to make the workplace more accessible to disabled workers.

The breathtaking fact is that today some 51 million Americans – almost 40 percent of the workforce – now regularly

work at home for a significant amount of time. Which clearly argues that acceptable, easily implemented communications technology for the home is *no longer a luxury but a critical need.*

Commuting is changing.
It is now easier, cheaper
and faster to move
work to the people than
the people to work.

Peter F. Drucker, Management
Consultant & Author

The Answer: ISDN

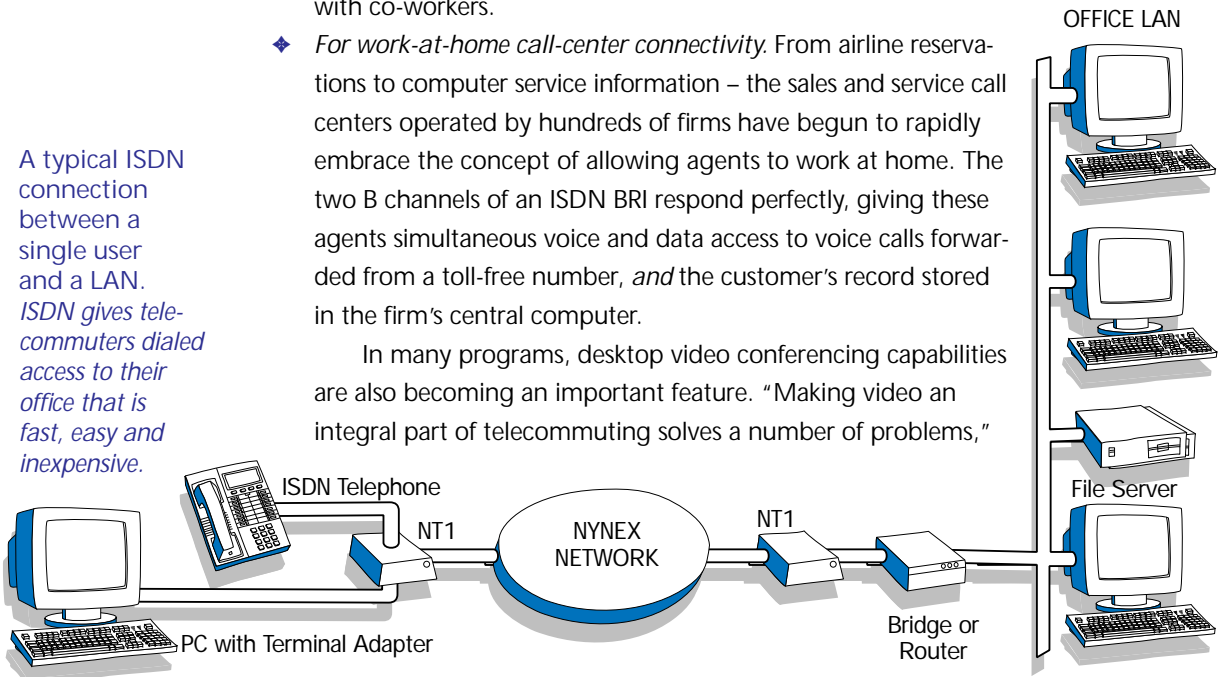
ISDN has spurred a rapidly growing range of simple, easily installed equipment configurations, transparent access to telephone, e-mail and other workplace services, and transmission speeds that have proved more than acceptable for full interconnection of work-at-home PCs to LANs, hosts, and even the most graphically intensive databases.

ISDN responds to the needs of the telecommuter in many ways:

- ◆ *For basic connectivity.* For those who predominantly make and manage work-related telephone calls, the ISDN solution is both inexpensive and elegant. A sales representative, for example, needs a telephone, perhaps a fax and some method of accessing basic e-mail and similar services through a desktop computer. A single BRI line offers D-channel access to e-mail, bulletin boards and data servers, while keeping two voice channels open for both incoming and outgoing calls.
- ◆ *For connectivity to LANs and co-workers.* For those who work with computers, the ISDN solution is equally responsive. Through a single ISDN BRI connection, major components of the office's functionality can be "transported" to equipment in their homes. This functionality includes: high-speed access to the user's LAN, file server, and other data; full access to voice and e-mail messages; and interconnections to other company LANs or hosts, remote systems, and perhaps other networks such as the Internet or distant research systems. In many early trials, desktop video capabilities have also made possible face-to-face meetings with co-workers.
- ◆ *For work-at-home call-center connectivity.* From airline reservations to computer service information – the sales and service call centers operated by hundreds of firms have begun to rapidly embrace the concept of allowing agents to work at home. The two B channels of an ISDN BRI respond perfectly, giving these agents simultaneous voice and data access to voice calls forwarded from a toll-free number, *and* the customer's record stored in the firm's central computer.

In many programs, desktop video conferencing capabilities are also becoming an important feature. "Making video an integral part of telecommuting solves a number of problems,"

A typical ISDN connection between a single user and a LAN. ISDN gives telecommuters dialed access to their office that is fast, easy and inexpensive.



said Anthony Antonuccio, vice president of marketing at *VIVO Software, Inc.* in Waltham, MA. "It addresses telecommuters' isolation by letting them see and work with others in their group, and lets managers work naturally and effectively with remote colleagues."

Equipment Needs for the Central Location

For the company supporting work-at-home alternatives, equipment needs and configurations are relatively straightforward. In fact, LAN bridges and gateways capable of supporting the terminal adapters and other devices used by telecommuters may already be in place – serving remote LAN connections – or can be quickly installed. Since many of the calls received from telecommuters are relatively short, this gateway equipment already in place can often be used without upgrading.

SOME TRENDSETTING PROGRAMS

Enterprising work-at-home programs throughout the Northeast are proving the value of telecommuting to both employers and workers:

- ◆ After an exhaustive study and several successful tests, a leading *New York City investment banking firm* is in the process of installing more than 600 ISDN lines for high-speed, work-at-

home connections to the company's central backbone network.

The program enables most of the firm's key traders and analysts to telecommute one or more days a week, and also represents a major strategy to deal with snowstorms, transportation strikes, bridge closures and other natural and manmade barriers that can make it impossible for employees to reach their offices in lower Manhattan.

Similar programs are now being implemented at several other investment and financial firms in both New York and Boston.

- ◆ *Bausch & Lomb's Polymer Technologies Corporation* is the world's leader in the design, manufacture and sale of rigid gas-permeable contact lenses. It is also a company with a major commitment to ISDN.

"ISDN makes possible the concept of a *virtual company*," says Dr. Daniel Gingras, director of the corporation, "because it transports both the expertise of our people and the power of our

The program . . . also represents a major strategy to deal with . . . natural and manmade barriers that make it impossible for employees to reach their offices

“ISDN makes possible the . . . virtual company.”

systems wherever and whenever we need them.” Virtually anyone in the corporation, for example, can access almost any LAN, WAN or mainframe system from their office, from another office or from their home through dialed ISDN connections.

“Home becomes an integral part of the office,” said

Dr. Gingras, “which means that we can truly start balancing the needs of our jobs and families. Any member of our staff can complete much of a project at home. Our jobs deal basically with information, and information can be delivered where we need it.” Polymer Technologies uses a range of AccessWorks equipment to link its central systems, offices and homes.

The company has also committed to a range of video conferencing applications, with high-speed T1 links between its major sites. It is also extending this backbone video network with dialed ISDN connections to offices in Hong Kong, London, Rochester and San Antonio, as well as to desktop video connections in key executive’s homes.

- ◆ *Lotus Development Corporation* in Cambridge is testing an ambitious work-at-home program, says Jerry Audet, the firm’s telecommunications analyst. “We have about 30 people now,” he says, “and expect to be ramping up to about 100 in the near future.” Telecommuters include consultants, sales people, and a range of others.

“They all need high-speed access to their office LANs and servers,” he notes, “and ISDN gives them that.” Lotus uses Gandalf equipment capable of compressed transmission speeds up to a megabit a second.

- ◆ *McDonald’s Corporation*, the fast-food restaurant chain based in Oak Brook, IL, sees telecommuting as an effective response to the Clean Air Act and other legislation. According to Patrick Krause, director of network systems, they also saw the potential to increase employee productivity, improve morale with more flexible working arrangements, and defuse what had become a chronic need for space.

Today, some 250 employees work at home, linked through ISDN to the company’s various information systems. Many also have desktop video conferencing capabilities, and some even

Bringing the work to the worker. With high-speed access to office LANs, file servers and other data, plus full access to the Internet, voice and e-mail, ISDN truly transports the work to the telecommuter. Desktop video can also facilitate face-to-face meetings with co-workers and managers.



conduct meetings from their homes with key suppliers. In addition, a growing number of field representatives, who travel to restaurants around the nation, often dial into company databases through ISDN connections.

- ◆ At the regional headquarters of *Silicon Graphics Incorporated* in Hudson, MA, a significant portion of its software and systems engineers currently work at home through ISDN connections. Using Motorola and Northern Telecom equipment for their home-based SGI Unix workstations, the engineers dial into the company's PRI hub to work on a range of computer and applications software. Through their video-equipped systems, they can also do person-to-person video conferencing to share and exchange ideas with their peers.

A number of the company's sales representatives also use SGI workstations and ISDN to tap into their headquarters' LAN for e-mail and bulletins, and to access a range of sales and marketing databases. Some of the sales reps can also use their systems for brief video meetings with co-workers at headquarters and at home.

- ◆ *Lawrence Livermore National Laboratory*, in Livermore, CA, has more than 200 employees currently telecommuting. Virtually all need extended high-speed access to the company's scientific, engineering or administrative LANs according to Natalie Clinton, operations manager of the LLNL telecommunications systems department

Clinton, who heads this growing program, notes that work-at-home scientists use the ISDN facilities for everything from community service to moon watching via satellite image transmissions (see above). She herself telecommutes one day a week, accessing a range of LANs on the sprawling campus.

"Modems were useful for text-based e-mail," she said, "but for real telecommuting people need to have high-speed Ethernet access at home. Today, ISDN gives them this kind of performance, and equipment prices keep getting better all the time."

- ◆ More than 160 executives of *Microsoft Corporation* in Redmond, WA – including its chairman Bill Gates – have been telecommu-

A Physicist Telecommutes

At the Nuclear Chemistry Division of Lawrence Livermore National Laboratory, physicist Joseph Carlson likes to work at home, especially after hours and on weekends.

"I've always done that," he says, "but in the past I used a modem which did not allow me to duplicate my work environment." On a Unix workstation, he employs various data visualization techniques to identify trends or patterns in large quantities of data. The resulting images can have from 10,000 to 50,000 points, and were simply too large for transmission through a 14.4Kbps modem. He often brought home high-capacity disk cartridges, but still lacked access to much of the software on his office system.

Today, he works at home regularly. A Cominet bridge offers access to his workplace LAN at 128Kbps (or roughly 512Kbps with compression), and lets him access both software and images as he needs them.

"A typical megabit-sized file," he notes, "downloads in about two seconds."

ting through ISDN since October 1993. In addition, some 500 vendors and suppliers have BRI connections to access the company's systems for product testing, uploading and downloading of software, and a host of administrative and scheduling data.

Microsoft's program is also a test-bed for the company's growing commitment to ISDN products and software – for group collaborations, video conferencing, ISDN extensions of its *Windows* technology, and PC-based control of ISDN voice and data telephone installations.

“It’s definitely an idea whose time has come.”

The Wave of the Future

“There is a strong and growing trend towards thoughtful and effective telecommuting,” says Marc Josephson, president of *Advanced Digital Networks*, a broad-based telecommunications equipment and support firm in the New York area.

“It reduces costs, cuts space requirements, cleans up the air and makes for happier, more loyal workers. It’s definitely an idea whose time has come.”