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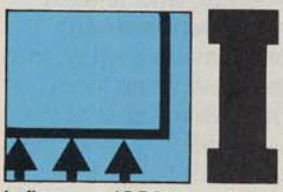
Wanted: Concerned users to join ISDN (r)evolution

It's possible for users to determine the success of the integrated services digital network in the United States.



Information network users can influence ISDN regulatory and standards processes in the United States to the degree that they directly participate in these processes. Traditionally, users have played a small role in shaping communications policy in the United States, yielding this task to vendors of the equipment and services they purchase.

The ISDN evolution, and the user community's role in guiding it in the United States, demands a strategy for evaluating the standards and regulatory issues at stake.

For the majority of its evolution, the telephone network was modified and embellished at the common carrier's convenience and discretion. Furthermore, these exchanges were made, by and large, unbeknownst to the network's users. At this juncture, all major telephone companies have ISDN-deployment strategies, but find that without enthusiastic user demand, these strategies have limited value.

In the era of deregulation and competition, it is difficult for vendors to market new products and services without first understanding users' requirements and desires. Likewise, in some instances competition introduces so many choices to the user that he wishes there were, once again, a monolithic industry structure.

In today's telecommunications and data communications environment, users have two avenues for ensuring that their myriad choices for products and services are on common ground: standards and regulations.

ISDN is a digital communications medium evolving from the public switched telephone network. It will offer standard end-to-end connections and simultaneous support of voice and nonvoice services—all this through a single access. ISDN will benefit users and carriers alike because of the economies possible from using digital technology. It will also benefit users and carriers because it integrates voice, data, and video transmission in a single transport.

The fundamental building block of the ISDN is a 64-kbit/s pulse code modulation channel. Known as the B channel, or basic-access channel, it is designed to carry circuit-switched voice and circuit- or packet-switched data at 64 kbit/s or less.

The D channel is provided for out-of-band signaling of the B channel. It is a packet-switched channel that, typically, will operate at 16 kbit/s. The D channel, when not signaling for a B channel, may be used for low-speed data transmission, such as that employed in telemetry services.

The ISDN subscriber may obtain basic access (at 144 kbit/s, two B channels plus a D channel) or primary access (1.544 Mbit/s, or 23 B channels plus one D channel) to the network, on a switched, dynamic-allocation basis. Subscribers who desire a nonswitched circuit may access what is called the H0 channel, which operates at 384 kbit/s, or the H1 channel, which operates at 1.536 kbit/s. H0 and H1 channels may or may not include a D channel, depending upon the user's requirement for signaling.

Within the customer's premises, the CCITT recommendations require a balanced, metallic, four-wire transmission medium capable of transmitting bidirectionally at 192 kbit/s. This wiring is considered to be one continuous cable, with provisions for equipment and network terminations.

Most foreign countries, unlike the United States, which has the most deregulated telecommunications industry in the world, will design and deploy their own ISDNs through their respective government authorities—the Postal, Telegraph, and Telephone agencies, or PTTs. Some countries have established 25-year national plans and have created cabinet-level positions

specifically for implementing their ISDNs.

In European countries, where analog technology lags considerably behind that of the United States and Canada, the ISDN evolution is seen as the vehicle for springing into the so-called information age of digital communications and attaining a level of service heretofore unknown there. The countries of the European Economic Community are embarking on a 10-year drive to improve Europe's antiquated telecommunications installations with a joint program called RACE (Research in Advanced Communications technologies for Europe).

By examining the deployment of ISDNs in other countries, users can better understand the benefits of ISDNs, the implications of government intervention in ISDN planning, and the value of their own involvement in the process of defining ISDNs in the United States.

The Canadian PTT, Telecom Canada, controls the communications industry in Canada and has chosen ISDN for the design concept of its telecommunications future. Its largest telephone company, Bell Canada, serves 60 percent of Canada's 16 million telephones in Quebec and Ontario provinces and in eastern sections of the Northwest Territories.

Bell Canada has been on the leading edge of digital communications technology for more than a decade. In 1972, Bell Canada offered the first digital leased-line network service in North America—Dataroute. In 1976, Bell Canada introduced Datapac, North America's first commercial public packet-switching network.

Telecom Canada now has the world's largest all-digital long-distance voice network and offers, through its telephone companies, services that eventually will be folded into an ISDN, such as electronic mail, voice mail, videotex, telemetry, and directory services. By 1990, Telecom Canada projects, 65 percent of local loops, 40 percent of local switches, and 85 percent of tandem switches will be digital.

In 1971, the French telephone network was considered hopelessly obsolete. Consequently, the French PTT declared that revamping and digitizing the network would become a national priority.

Currently, the French tout their telephone network as the most digitized and modern in the world. Sixty percent of France's short-distance transmission is digital, and more than 50 percent of tandem switches and approximately 45 percent of local exchanges will be digital by the end of 1985.

In its migration toward a national ISDN, the French PTT offers digital services such as Transfix, Transcom, and Transdyn. Transfix is a leased-line service that provides connection at data rates from 48 kbit/s to 2,048 Mbit/s. Transcom is a basic 64-kbit/s switched service, and Transdyn is a switched service with rates up to 1.92 Mbit/s.

The French PTT is introducing ISDN in rural Brittany, initially targeting small businesses and professional users. This approach is contrary to most other countries, which will seek large businesses in major cities to be the first users of ISDNs. The French project that 95 percent of the country will have ISDN connectivity by 1995.

Deutsche Bundespost (DBP), the West German PTT, plans to make West Germany an ISDN-using nation by 1990. Although West Germany is a latecomer to the digitization process—it did not begin digital transmission until 1970—it currently is instituting ISDN field trials to hasten the evolutionary process and expects to have 6 million ISDN subscribers by the year 2000.

The DBP recently established two field-trial centers—one in Mannheim and another in Stuttgart. Each pilot will include at least 400 subscribers and be connected to West Germany's public network in 1988, when the demonstration phase is completed. Using existing two-wire local loops, each pilot subscriber will have a single access for voice, data, text, and image transmission.

The Italian PTT, through its major telephone company, SIP, began its first ISDN trial in 1984, in Venice, involving four large companies as initial subscribers. The participants have access to 80-kbit/s full-duplex channels via two-wire local loops. The services available in the trial are telephone, videotex, and Teletex.

Using an ISDN-standard telephone terminal, with alphanumeric keyboard and alphanumeric display, the subscribers can monitor many new telephone functions. For example, a user can observe the cost of the call-in-progress, with continuous updating. In addition, the subscriber can verify on the readout the caller's number before he answers the call.

SIP estimates that all of Italy will be interconnected by an ISDN in 1990, when 90 percent of local loops will be digital and wideband services will be widely available.

Through Nippon Telegraph and Telephone (NTT), its quasi-PTT, Japan is developing a nationwide ISDN, due for completion in the year 2000, at an overall cost of $125 billion.

Japan, like West Germany, was late in migrating from analog technology. It introduced digital transmission in 1975. By 1990, however, NTT expects that 100 percent of its long-haul intercity links will be digital, as well as 60 percent of its tandem switches and 30 percent of its local switches.

The Japanese ISDN, which began operation in 1984, is called the Information Network System, or INS, and will be based on lightwave and satellite technologies. The INS, at present, accommodates 9,000 existing telephones, 400 digital telephones, and 1,100 data and facsimile terminals. Sevices offered by INS include telephone, Teletex, videotex, slow-scan video, data, telemetry, and facsimile.

Six thousand subscribers have been chosen by NTT to use and monitor INS services for six years. Residential subscribers constitute 64 percent of the group; business offices 29 percent; and retail establishments 7 percent.

British Telecom, the United Kingdom's PTT, now half-owned by the public, established a lead on the rest of the world in 1983 by actually marketing its ISDN concept as Integrated Digital Access (IDA). IDA will be marketed to large users, as British Telecom does not believe there is much benefit from ISDN usage, at this time, to the small user.

Table 1: Evolution of CCITT study groups

GROUP	1981-1984	1985-1988
I	DEFINITION AND OPERATIONAL ASPECTS OF TELEGRAPH AND TELEMATIC SERVICES	DEFINITION, OPERATION, AND QUALITY OF SERVICE ASPECTS OF TELEGRAPH, DATA TRANSMISSION, AND TELEMATIC SERVICES
II	TELEPHONE OPERATION AND QUALITY OF SERVICE	OPERATION OF TELEPHONE NETWORK AND ISDN
III	GENERAL TARIFF PRINCIPLES	GENERAL TARIFF PRINCIPLES, INCLUDING ACCOUNTING
IV	TRANSMISSION MAINTENANCE OF INTERNATIONAL LINES AND NETWORKS	TRANSMISSION MAINTENANCE OF INTERNATIONAL LINES, CIRCUITS, AND CHAINS OF CIRCUITS; MAINTENANCE OF AUTOMATIC AND SEMI-AUTOMATIC NETWORKS
V	PROTECTION AGAINST DANGERS AND DISTURBANCES OF ELECTROMAGNETIC ORIGIN	PROTECTION AGAINST DANGERS AND DISTURBANCES OF ELECTROMAGNETIC ORIGIN
VI	PROTECTION AND SPECIFICATIONS OF CABLE SHEATHS AND POLES	OUTSIDE PLANT
VII	NEW DATA COMMUNICATIONS NETWORKS	DATA COMMUNICATIONS NETWORKS
VIII	TERMINAL EQUIPMENT FOR TELEMATIC SERVICES	TERMINAL EQUIPMENT FOR TELEMATIC SERVICES
IX	TELEGRAPH NETWORKS AND TERMINAL EQUIPMENT	TELEGRAPH NETWORKS AND TERMINAL EQUIPMENT
X	(NONE)	LANGUAGES AND METHODS FOR TELECOMMUNICATIONS APPLICATIONS
XI	TELEPHONE SWITCHING AND SIGNALING	ISDN AND TELEPHONE NETWORK SWITCHING AND SIGNALING
XII	TELEPHONE TRANSMISSION PERFORMANCE AND LOCAL TELEPHONE NETWORKS	TRANSMISSION PERFORMANCE OF TELEPHONE NETWORKS AND TERMINALS
XIII	(NONE)	(NONE)
XIV	(NONE)	(NONE)
XV	TRANSMISSION SYSTEMS	TRANSMISSION SYSTEMS
XVI	TELEPHONE CIRCUITS	(NONE)
XVII	DATA COMMUNICATIONS OVER THE TELEPHONE NETWORK	DATA TRANSMISSION OVER THE TELEPHONE NETWORK
XVIII	DIGITAL NETWORKS	DIGITAL NETWORKS, INCLUDING ISDN

INDICATES CHANGE IN TITLE

CCITT = INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE

IDA will evolve from British Telecom's System X family of digital services, which range from packet-switching network access and digital leased circuits to satellite links. British Telecom expects the United Kingdom to have nationwide coverage of a digital network by 1988, when there will be 1,000 IDA access locations.

Subscribers in London will be the first to use IDA, with expansion planned to Birmingham and Manchester near the end of 1985, when service will be available from 60 access locations. Initial tariffs prescribe a $195 connect charge for single-line IDA and an annual $224 rental charge.

IDA will offer telephone; circuit-switched, packet-switched, and private-line data; Telex; Teletex; facsimile; slow-scan video; and videotex. In addition, British Telecom will market a variety of electronic mail and voice services through IDA.

The standards process

The primary group responsible for generating international ISDN standards is the CCITT (International Telegraph and Telephone Consultative Committee), one of seven ITU (International Telecommunications Union) organizations, headquartered in Geneva, Switzerland. The ITU, an international treaty organization, has been a specialized agency of the United Nations since 1948.

The objective of the CCITT is to establish recommendations, or standards, for end-to-end performance, interconnection, and maintenance of the world's networks for telephone, telegraph, and data communications. These recommendations are based on consensus, are not enforceable, and are ratified every four years at the plenary assembly. At the Eighth Plenary Assembly, held in October 1984 in Torremolinos, Spain, the I-Series recommendations (the "I" standing for ISDN), among others, were accepted unanimously by CCITT members.

Membership in the CCITT consists of four classes:

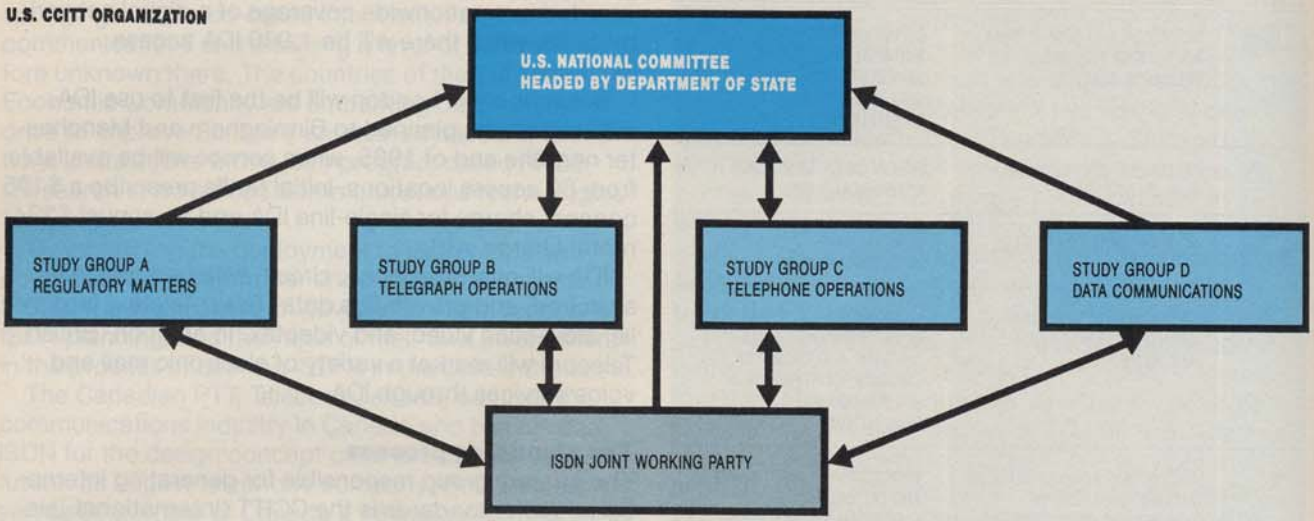
- Government Administrations.
- Recognized Private Operating Agencies (RPOAs).
- Scientific or Industrial Organizations (SIOs).
- International Organizations.

Voting in standards issues is a privilege reserved for the government of each member country, and each country is entitled to one vote. RPOAs, or common carriers, and SIOs—manufacturers and R&D firms—often represent their governments as technical contributors to the CCITT's standards process, even though they do not vote.

International organizations consist of standards groups, such as the ISO (International Organization for Standardization), and user groups, such as the International Air Transport Association (IATA) and the International Telecommunications Users' Group (INTUG). These organizations play a somewhat subordinated role to RPOAs and SIOs, and typically attend plenary assemblies out of general interest.

The ISDN subject has stimulated a new focus for the CCITT, and at the Eighth Plenary Assembly the titles of several CCITT study groups were modified to incorporate ISDN or acknowledge its effect on the overall

1. U. S. role in CCITT. *The United States' membership in the CCITT is held through the State Department's Bureau of Economic Affairs, Office of International Communications Policy, and is composed of one committee and five study groups. Study group membership is extended to all interested in telecommunications.*



standards process. Table 1 lists the titles of the CCITT study groups for the 1981-1984 and 1985-1988 study periods, respectively, confirming this new focus.

Additionally, a new study group, "S," was created to examine the entire study group structure for possible revision at the Ninth Plenary Assembly. A key reason for this study is that ISDN developments are narrowing the distinction between voice and nonvoice services, thereby eliminating the need for separate efforts in these areas.

U. S. participation

Official membership of the United States in the CCITT is through the Department of State, Bureau of Economic Affairs, Office of International Communications Policy. The U. S. CCITT is composed of a national committee and five study groups: Regulatory Matters, Telegraph Operations, Telephone Operations, Data Communications, and the ISDN joint working group, as shown in Figure 1.

Membership in the U. S. CCITT study groups is extended to all parties interested in telecommunications, including users, carriers, manufacturers, national standards organizations, and government agencies. There are no dues, and membership is obtained through the chairman of the desired study group, not through the State Department.

The T1 Committee

An important source of U. S. ISDN standards-making is the T1 Committee, whose structure is shown in Figure 2. T1 is an independent organization, approved by the American National Standards Institute (ANSI), that develops interconnection standards for the U. S. telecommunications network. The T1 designation represents the ANSI nomenclature for committees—"T" for telecommunications, "1" for first T committee—and is not related to the 1.544-Mbit/s T1 specification.

Membership in the T1 Committee is open to all interested parties and currently comprises exchange carriers, interexchange carriers, resellers, manufacturers, vendors, government agencies, user groups, consultants, and liaisons. The T1 Committee employs the Exchange Carriers Standards Association, or ECSA, a trade association of wire-line exchange carriers, as its secretariat and administrative body.

Within the T1 Committee are six subcommittees, one of which is the T1D1 Subcommittee, devoted to ISDN standards work. T1D1 prepares ISDN-related positions and standards for submission to the U. S. CCITT. T1D1 further consists of three working groups:

- ISDN Architecture and Services (T1D1.1).
- Switching and Signaling Protocols (T1D1.2).
- Physical Layer (T1D1.3).

The X3 Committee

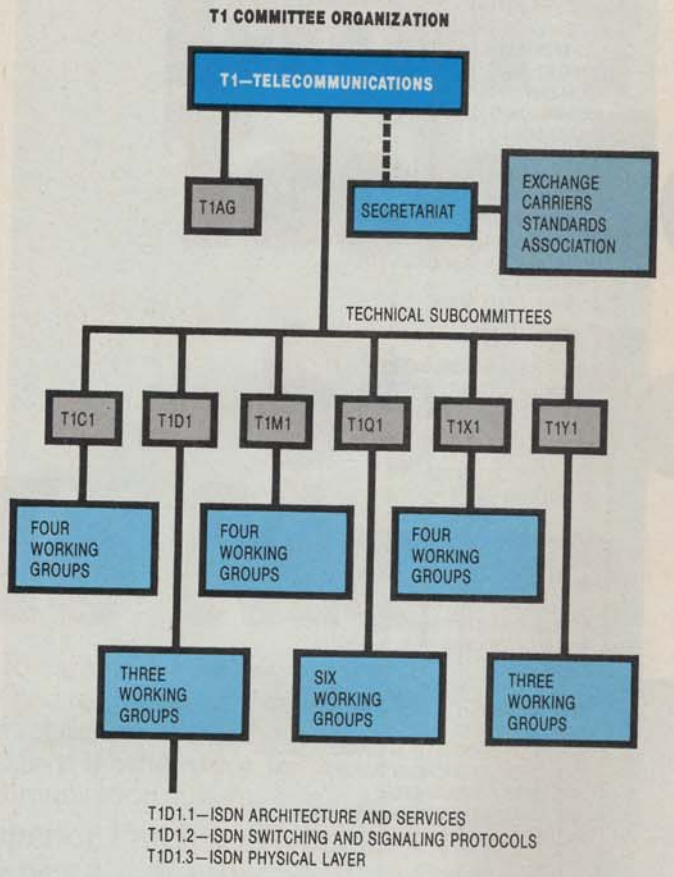
Since ISDNs incorporate data communications and other computer-related elements, such as the Open Systems Interconnection (OSI) reference model, the ANSI-approved X3 Committee also is involved in ISDN-standards contribution in the United States, along with the T1 Committee.

The X3 (Information Processing Systems) Committee creates standards in computers, information processing, peripheral equipment, and magnetic media. Its secretariat is the Computer and Business Equipment Manufacturers Association (CBEMA). A formal liaison exists between the T1 and X3 committees for creating ISDN standards.

Basic and enhanced services

One of the issues users must confront in subscribing to ISDNs is deciding where they would prefer that the bulk of ISDN-connection intelligence reside. From a regulatory perspective, this is exclusively the domain of the Federal Communications Commission, which, through

2. Important source. *The T1 Committee (unrelated to the 1.544-Mbit/s specification) is a key source of U. S. telecommunications interconnection standards.*



Computer Inquiry II, has established an ever-moving demarcation between basic and enhanced telecommunications services.

This demarcation, based largely on the 1980-vintage ability to distinguish between data-only and voice-only equipment, dictates the allowable sophistication of a network service and, consequently, the intelligence necessary in customer premises equipment (CPE) to interface with that network service.

According to Computer Inquiry II, basic services are those that provide transmission capacity for the transport of information and typically are offered by common carriers. An example of a basic service is POTS (plain old telephone service). Enhanced services are those offered juxtaposed with basic services. They necessarily alter the format, content, code, or protocol of a subscriber's transmitted information. An enhanced service requires computer processing to warrant its distinction—as in, say, voice mail and videotex.

Essentially, Computer Inquiry II was created to prevent large common carriers from using their monopolistic advantages to enter and, subsequently, dominate the information processing business. The original ruling dictated that common carriers be permitted only to route and switch the information they transport, and that enhanced services be offered by independent providers or separate, unregulated subsidiaries of common carriers.

However, the basic premise of ISDN is to have both basic and enhanced services inextricably joined—true service integration—in a single transport. Therefore, the United States, because of regulatory impositions, appears unique in its contributions to the CCITT's ISDN standards.

Because the process of establishing separate subsidiaries by common carriers is redundant and expensive, as well as confusing to customers, the seven RBOCs (regional Bell operating companies) petitioned the FCC for protocol-conversion waivers, which would allow these carriers to provide their customers both X.25-to-X.75 (interconnection of separate packet-switching networks) and asynchronous-to-X.25 (CRT-terminal-to-packet-switching-network) protocol conversion. These are considered enhanced services.

Consistent with the Reagan Administration's emphasis on a free market, the FCC recently exhibited a willingness to reexamine past FCC decisions, especially Computer II, to determine whether outdated regulations are appropriate for current market conditions.

In December 1984 and March 1985, respectively, the FCC ruled in favor of the RBOCs' requests to perform both X.25-to-X.75 and asynchronous-to-X.25 conversions, dropping the separate-subsidiary requirement. These major decisions were a result of significant user demand for protocol-conversion services, which consequently obviate the intelligence required in the CPE to perform the same function.

Network-channel terminating equipment

Another stipulation of Computer Inquiry II is that common carriers may not sell CPE and basic services as a package. CPE, like enhanced services, must be sold by a separate subsidiary of the carrier.

Network-channel terminating equipment (NCTE) terminates a carrier's digital service on the customer's premises, providing electrical and mechanical maintenance (remote testing), and channel-provisioning functions for both the carrier and the user. The FCC ruled, due largely to protests from the Independent Data Communications Manufacturers Association (IDCMA), that NCTE shall be customer premises equipment and subject to competition on the open market. IDCMA's argument was that carriers had no inherent right to control a potentially lucrative equipment market such as NCTE.

Traditionally, NCTE was designed, built, installed, and tariffed by the common carrier, primarily AT&T. However, the FCC's ruling stated that there was no proof, as AT&T alleged, that independently manufactured and installed NCTE would harm the carrier's network. This ruling is contrary to the original CCITT ISDN concept of carrier-owned termination, which was modified to accommodate the United States.

Consequently, the T1 Committee is designing a new interface—to be positioned between the customer-owned NCTE and the end of the carrier's loop—that will affect only the United States' deployment of ISDNs.

While the concerns of carriers and manufacturers in

the NCTE issue are quite clear, those of the user community are not. After all, users ultimately bear the consequences of major decisions like this one. Perhaps users' input would have resulted in a different outcome.

Compatibility is key

Private networks are fashioned by communications users to fill a need not available from public networks, because of either technological or regulatory reasons, or both. Private networks consist of privately owned facilities or dedicated leased facilities and are used for local as well as long-haul voice and data traffic.

Because the majority of large users are public corporations, they are beholden to their stockholders. Stockholders are a very short-term-oriented group who care more about an investee's bottom line than about how the bottom line is derived.

An increasingly significant contributor to the bottom line is a company's communications network—from both cost and revenue perspectives. Therefore, these large users are motivated constantly to construct private networks that solve today's or yesterday's problems.

Faced with rapidly changing technology and the vicissitudes of regulatory fervor associated with changing administrations in Washington, the corporate communications manager is pressured to make difficult decisions about expanding his network that may prove, in the long run, to be fatal.

An ISDN standardization strategy is a logical and safe alternative to piecemeal insertion of network links—based on differing, proprietary solutions from every vendor. This will ensure that a user's private networks evolve with the technology and regulations of the time.

The FCC, for example, currently regards as questionable the future of private-line use. Because many private lines are being used to bypass the local exchange, the FCC believes MTS/WATS rates are priced uneconomically and should be reduced. The commission, furthermore, has established a $25 surcharge on private lines to compensate carriers for this unmeasurable traffic. Once the cost of MTS/WATS and private lines converge, the fate of uneconomic private-line usage, at least, will become dim.

Another consideration is that common carriers, both exchange and interexchange, are becoming more sophisticated with their private-line alternatives, especially those that resemble ISDN services. Illinois Bell, for example, is now offering legitimate ISDN services to large businesses that want to experiment with them. AT&T is marketing its new network service that will enable a customer to use the public switched telephone network as a quasiprivate network, by having statistically higher access to it than other users. These services give the users alternatives previously unavailable and are endorsed favorably by the FCC, too.

Since users will always have requirements for some form of private networks, they should give considerable thought to making these networks conform to ISDN standards. By striving for ISDN compatibility, users can reduce the risks related to network obsolescence and can better plan for future expansion.

The only way users will witness an ISDN evolution in the United States that matches both their technical and fiscal needs is by becoming active in creating standards and interacting with the three federal government bodies responsible for overseeing the U. S. ISDN evolution: the FCC, the Department of Commerce's NTIA (National Telecommunications and Information Administration), and the Department of State's U. S. CCITT National Committee (Table 2).

By helping create sensible alternatives for themselves, users lessen the burdens of excessive competition and regulation. Active user participation, along with manufacturers and carriers, will be the key to a successful ISDN evolution in the United States. ■

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Table 2: Key contacts

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