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JIPDEC is a non-profit organization founded in 1967 with the support of the Ministry of International Trade and Industry, the Ministry of Posts and Telecommunications and related industry circles for the purpose of promoting information processing and the information processing industry in Japan.

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FROM THE EDITOR

Communication is essential to the conduct of everyday life. This is true for man as well as for the other social creatures that inhabit our world. But before communication can take place, the parties involved must first have some sort of predetermined set of rules or procedures, must have a medium for exchanging information and must have the means for recognizing and retaining that information.

These basic principles apply whether the parties involved are human beings or animals. But in the case of we humans, the procedures we use for communicating with one another are much more advanced and complex, the media employed are more diverse, and the recognition and memory capabilities required are quite a bit more advanced than those of the lower animals. This is particularly evident from the fact that we use words as our basic means of communication. It is the use of words, in both their spoken and coded forms (letters/characters and figures), that has enabled man to devise ways of communicating with one another over distance.

Telecommunications, i.e. the use of electricity to carry out communications, is a uniquely human means of communications that makes it possible for us to convey messages very quickly over long distances. Technological innovations in the field of telecommunications have allowed us to expand our means of communication from analog voice communications to digitalized data communications. The appearance of yet newer technologies and innovative forms of communications media has enabled man to achieve rapid advances in telecommunications, resulting in the development of integrated services digital networks (ISDN).

The telecommunications business has since its inception been considered a national infrastructure, a kind of central nervous system for nations, and as such has been promoted in countries around the world in the form of national monopolies. Japan has been no exception to this rule. Nippon Telegraph and Telephone Public Corporation and Kokusai Denshin Denwa Co., Ltd. had monopolies on domestic and overseas telecommunications in Japan for a long time. But rapid progress in the field of information processing resulted in the move from batch processing to online processing, and the merger of computers and communications. This made it increasingly difficult

to clearly distinguish between the telecommunications business, which was the monopoly of two major Japanese public corporations, and information processing, which was carried out freely by private companies. Advances in technology subsequently began to make it possible for private firms to enter the field of telecommunications. Fears were then raised that Nippon Telegraph and Telephone Public Corporation would abuse its monopoly position by entering the field of information processing services. Under these circumstances, and so as to deal effectively with the diversification of data communications needs, the Japanese government urgently pressed forward with policies designed to deregulate telecommunications in Japan. After numerous trials and tribulations, Japan passed a New Telecommunications Law in December 1984, and put it into effect the following year in April 1985. Large numbers of private firms entered the telecom business as a result, suddenly injecting an element of fair competition into the telecommunications business in Japan, expanding and developing the market for telecommunications services here.

In the midst of these developments, private companies internationalized their operations, increasing mutual interdependence among nations. This in turn has expanded the need for data communications on a global scale. It was under these conditions that Japan and the United States initiated international value-added network (VAN) services between their two countries. In future, Japan hopes to be able to extend these services to other nations around the world as well.

However, if the flow of data across borders (transborder data flow) becomes too brisk, we will be forced to consider regulating these flows and/or coming up with international standards to govern them. In order for Japan to help promote well-balanced informatization internationally, the government is going to have to further improve this country's telecommunications systems and policies.

This issue of the Japan Computer Quarterly, therefore, describes the development of telecommunications services in Japan and future trends expected in this field, and discusses current trends in ISDN and international VAN, complete with specific examples of each.

We sincerely hope the information presented on the following pages proves interesting as well as useful to our readers.

Yuji Yamadori
Director
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JAPANESE TELECOMMUNICATIONS SERVICES: CURRENT STATUS AND DEVELOPMENT TRENDS

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INTRODUCTION

For over a century now, Japan has been actively introducing new technologies into its telecommunications network, building it up into the huge system that exists today to service some 46 million subscribers.

The Japanese economy has downshifted from high to stable growth in line with the major structural changes that have taken place as a result of the oil shocks and the rising value of the yen. It has also undergone some modifications in keeping with the changing trend in national values away from placing priority on economic matters per se and toward enhanced quality of life.

Modern Japan is also evolving into an advanced information society, one in which the production, processing and distribution of information are expected to become more important than the manufacture, processing and distribution of goods. This being the case, demand for telecommunications services is likely to increase. But this demand will not be for ordinary telephone-based services alone. Rather, we anticipate strong demand for non-telephone-based services, such as data communications, high-speed facsimile and broadband image communications and other services made possible by the fusion of telecommunications and data processing. However, non-telephone-based services require advanced functions that are not possible with present-day telephone networks, which were originally constructed to transmit 4KHz analog telephone conversations. For this reason, Japan is constructing a new, more economic and efficient digital network that incorporates the latest in large-scale integration (LSI) and digital processing technologies. In April 1988, this network was used to commence integrated services digital network (ISDN) services based on the International Telegraph and Telephone Consultative Committee (CCITT)'s standard I interface.

There have also been some major changes in the telecommunications environment here in Japan in recent years. For example, in April 1985, a new telecommunications law was enacted in Japan which opened the domestic and international telecommunications markets to competition. By September 1987, there were a total of 26 Type 1 carriers offering telecom services via their own lines and other telecommunications facilities, and another 434 Type 2

telecom vendors who had started providing telecom services using facilities leased from the Type 1 carriers. The Type 1 common carriers are competing with one another to attract customers for their leased line, telephone and paging (beeper) services.

This report is designed to describe the current state of telecommunications services in Japan and the direction these services can be expected to take in future.

DEVELOPMENT OF TELECOMMUNICATIONS SERVICES

Evolution of Telephone Services

Back in the 1960's and 1970's, the telephone business in Japan consisted primarily of construction work aimed at eliminating the backlog of new subscribers and ushering in the age of automatic dialing. During that period, more

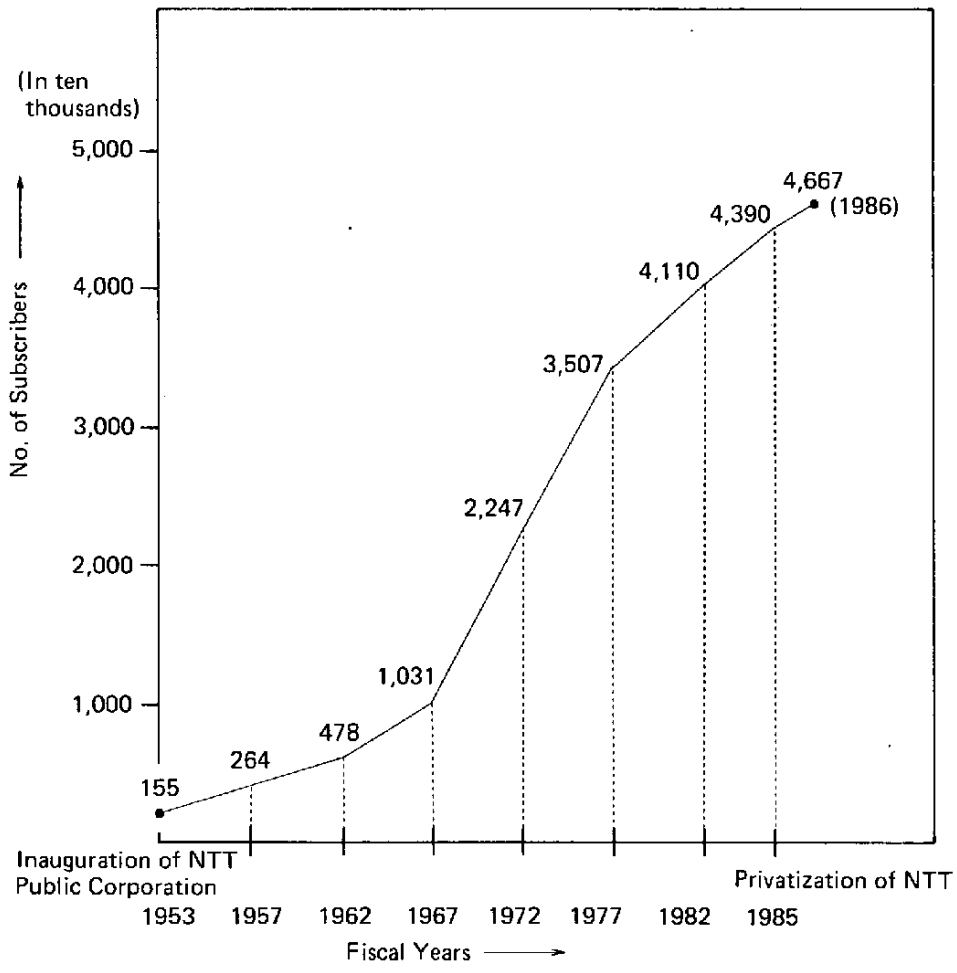


Figure 1. Growth of Domestic Telephone Subscribers Between 1953–86

than two million new telephones were installed per year, and in one year, over 500 telephone offices switched to the new automatic dial network. As a result of the hard work and effort expended during the 60' and 70's, by 1983, the backlog of new subscribers had been eliminated and every telephone in Japan had been converted to the automatic dialing system. Figure 1 provides figures on the growth of telephone subscribers in Japan between fiscal 1953, the year Nippon Telegraph and Telephone Public Corporation (NTT) was inaugurated, and fiscal 1986.

You can see from Figure 1 how telephone services have grown in Japan to date. However, a more advanced, diversified Japanese economy is making it all but impossible to fulfill customers' telecommunications requirements with basic telephone services alone.

Coping with changes in the nature of telephone traffic

Recent changes in the nature of telephone traffic in Japan have taken the form of sudden increases and localization of traffic, and the abnormal concentration of telephone calls during specific hours.

Whereas a total of 33.8 billion phone calls were made in Japan during 1976, this number had increased two-fold by 1986 to 71.8 billion calls. The increase in overseas calls for this same ten-year period was even more dramatic, jumping from 10 million calls in 1976 to 140 million calls in 1986. This increase in domestic and overseas calls between 1976 and 1986 is illustrated by the line graph shown in Figure 2. In order to keep telephone service charges as low as possible, it is extremely important to accurately predict future increases in telephone traffic by region and to systematically expand the scale of telephone exchanges to the optimum size and increase the number of transmission lines and facilities needed to meet anticipated increases in traffic.

Another recent characteristic of telephone traffic has resulted from the increase in home telephones. Whenever a disaster occurs someplace, people with relatives or close friends in the affected area rush to the phone to make sure everyone is alright. The abnormal peak traffic brought on by such occurences can far exceed the telephone networks abilities to process these calls. In order to prevent the abnormal affects of such massive congestion of telephone traffic, telephone exchanges have been equipped with special control functions, such as transmission control functions and connection control functions for calls to specified locations. Other measures being taken to deal with this problem include the use of redundancy, distributed and multi-channel network designs aimed at enhancing the reliability of the telephone network.

Coping with the diversification of telephone services

Another problem area is diversification. Japan ranks second only to the

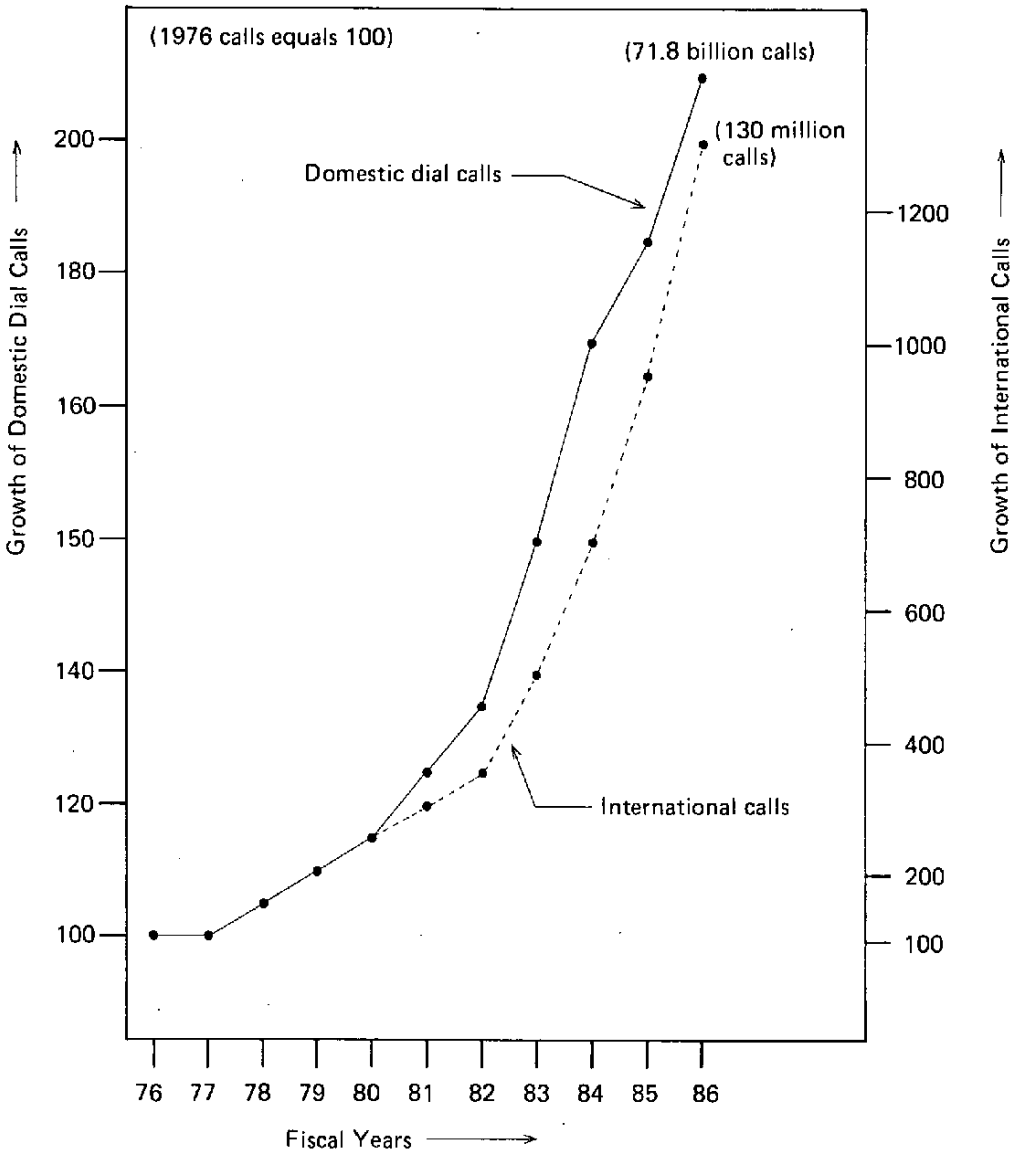


Figure 2. Growth of Domestic and International Telephone Calls Between 1976–86

United States in number of telephone sets installed. However, the frequency with which these telephones are used is comparatively low, only amounting to about one-half the utilization frequency per phone that is found in America. The reason for this is that Japan lags behind the United States in the development of new telephone services. It is the introduction of new services that gives rise to increased traffic. At Nippon Telegraph and Telephone Corporation (NTT), we are striving to meet the diversified needs of our customers by providing subscribers with new, advanced telephone services (See Table 1).

Introduction of Competition

Nineteen eighty-five marked the end of an epoch in the history of the telecommunications business in Japan. This is because 1985 was the year the New Telecommunications Law was implemented. This law introduced the principle of competition into both the domestic and international telecommunications markets in Japan, markets that had up until that time been the monopolies of NTT and the Kokusai Denshin Denwa

Table 1. Description of New Telephone Services

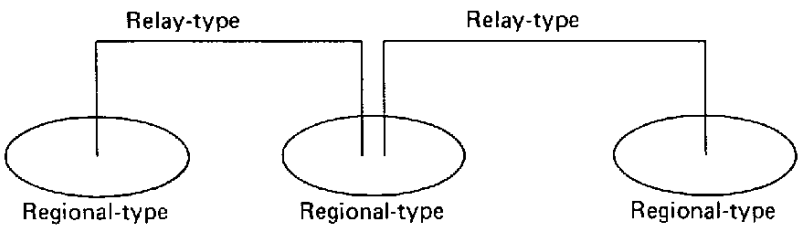
Representative Examples	Types of Service	No. of Users (As of fiscal 1986)
Card-operated Public Telephones	All public telephones in Japan used to be coin-operated, but NTT has developed card-operated public phones that it is installing nationwide. The cards used to operate these phones have a predetermined number of calls recorded on their magnetic strips, and sell for different prices according to the number of calls possible per card. Card sales are very favorable.	(No. of cards sold) 148.66 million
Free Dialing Service	This service enables callers to dial certain numbers free of charge; the recipient of the call pays the phone charges. This service is very similar to the "800" toll free call service offered by AT & T in the United States.	14,132 lines
Trio-phone Service	A Trio-phone enables the user to talk to two callers at the same time. For example, if a call comes in while a Trio-phone user is already talking to someone, he can operate a button on the phone to include the third person in the conversation as well.	1,405 subscribers
Telephone Conferencing Service	Telephone conferencing enables parties in up to 29 different locations to hold a conference over the telephone.	86 subscribers
Call Transfer Service	This service enables calls put into a user's home or office when he is not in to be automatically transferred a specified number where he can be reached.	68,914 subscribers
Message Dialing Service	NTT's message dialing service enables callers to record simple verbal messages in voice recognition storage devices incorporated into the telephone network itself for later retrieval by users.	Roughly 60,000 messages per day

Co., Ltd. (KDD), respectively. Four factors were instrumental in bringing about the introduction of competition into the telecom business here. These were 1) the rapid advances made in the fields of optical and satellite communications, LSI and interface technologies had begun to make it difficult for NTT and KDD to continue to monopolize the market; 2) increased private and economic activities had diversified and upgraded telecommunications requirements; 3) the view that the introduction of competition would provide a much needed shot in the arm to the telecommunications business; and 4) the need for a framework within which to provide a variety of low-cost telecom services in preparation for the coming of the advanced information society.

Table 2. Overview of NCCs and Their Services/Service Areas

Category	Company Name	Type of Service	Service Area	Starting Date
Relay-type	Daini Denden Inc.	Telephone and leased line	Tokyo, Osaka, Aichi, Okayama, Hiroshima and Fukuoka prefectures, and surrounding areas	Leased line: October 1986 Telephone: September 1987
	Japan Telecom Co., Ltd.	Telephone and leased line	Areas paralleling the Tokaido, Sanyo, Tohoku and Joetsu Shinkansen (bullet) train lines	Leased line: August 1986 Telephone: September 1987
	Teleway Japan Corporation	Telephone and leased line	Areas paralleling the Tomei and Meishin expressways	Leased line: November 1986 Telephone: September 1987
Regional-type	Tokyo Telecomcomunication Network Co., Inc.	Telephone and leased line	The Kanto region	Leased line: November 1986 Telephone: May 1988
	Lake City Cablevision Co., Inc.	Leased line	Seven cities and towns including Suwa and Okaya	Leased line: October 1987
	Osaka Media Port Corporation	Leased line	Osaka and nine surrounding cities	Leased line: March 1987
	Chubu Telecommunications Co., Inc.	Leased line	Portions of Aichi, Gifu, Mie and Shizuoka prefectures	Leased line: June 1988

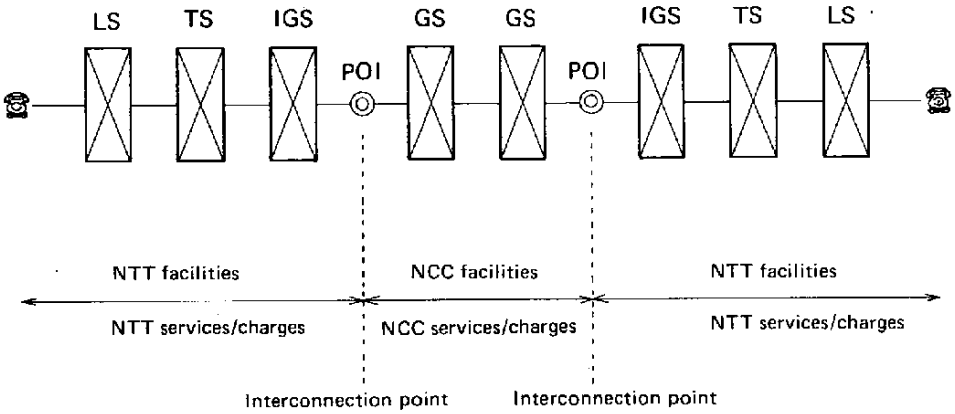
[Schematic of Service Categories]



These were some of the factors behind the introduction of competition into the telecommunications business here. Now, three years later, this competitition is making itself strongly felt. The most competitive of the Type 1 common carriers are the new entrants who are offering inter-city telecom services. In August 1986, a number of the new common carriers (NCCs) commenced leased line relay services between Tokyo, Osaka and Nagoya, those three metropolitan areas where the demand for telecommunications services is the greatest. In Septtember 1987, these same NCCs added telephone relay services to their menu of offerings to these three cities. The service charges levied by the NCCs are between 10–20% less than the fees charged by NTT for the same types of service. As a means of combatting these lower prices, in August 1987, NTT lowered its charges for medium- and long-distance leased line services by 10%, and followed this up in February 1988 with a 10% reduction in its charges for long-distance telephone calls as well. Nevertheless, according to the newspapers, just seven months after commencing telephone services, the NCCs had reportedly signed up over 2 million customers.

Table 2 provides an overview of Japan's domestic NCCs that are providing Tokyo, Osaka and Nagoya with leased line and telephone services.

The NCCs providing relay telephone services to Tokyo, Osaka and Nagoya interconnect with NTT as shown in Figure 3. As you can see, the NCCs have constructed their own transmission channels and gateway switches (GS) to



LS : Local switch
TS : Toll switch
IGS : Interconnecting gateway switch
GS : Gateway switch
POI : Point of interface

Figure 3. NCC-NTT Interconnection

relay telephone calls from one city to the next, but must interconnect with NTTs local networks via points of interface (POI) and interconnecting gateway switches (IGS) to complete their calls.

NTT subscribers who wish to make use of NCC inter-city telephone relay services must apply directly to the NCC. At the same time, these potential users of NCC relay services must put in a request to NTT to have an ID number installed at their local switch (local telephone exchange). This ID costs 2,000 yen to have installed, but once in the NCC relay service user can be dialed directly using the four-digit ID number in conjunction with his regular NTT telephone number. The utilization charges for inter-city telephone calls placed via this NCC-NTT route are calculated by adding the NCC's intercity fee to NTT's local network fee for each call. The NCC bills the user.

There is one more special characteristic of competition within Japan's telecommunications market. This is the Type 2 telecom vendors. Type 2 telecom vendors are not common carriers, but rather lease telecom lines from the Type 1 common carriers (NTT and the NCCs) to market value-added telecom services. The types of services offered by these vendors range from the simple resale of leased lines (no value added), to telecom processing services based on protocol and transmission speed conversion and packet-switched processing and computing services. When it comes to the simple resale of leased lines, there are Ordinary Type 2 vendors that have resold more leased lines than the combined total of the top three NCCs just discussed.

Expanding Non-telephone-based Services

In today's world with its ever advanced, more diversified and complex means of social and economic interaction and activities, there is a limit to how well ordinary telephone services that simply transmit human conversations from one point to another can satisfy presentday telecommunication needs. More specifically, existing telephone networks are not equipped with storage capabilities (memory functions), are not suited for handling the large volumes of data required in the transmission of diagrams and pictures, and are in big trouble when it comes to high-speed transmissions of digitalized information necessary with data communications. In order to overcome the limitations imposed by ordinary telephone services, and to meet the growing demand for non-telephone-based telecom services, NTT is constructing and attempting to expand separate non-telephone-based service networks to provide digital data exchange services, facsimile network services, videotex services and high-speed digital leased line services. Table 3 indicates the growth of demand for non-telephone-based telecom services during the five-year period 1982–86. As you can see, no matter what non-telephone-based service you look at, the demand for that service has grown considerably compared to demand for ordinary tele-

Table 3. Growth of Major Non-telephone-based Services During Five-year Period 1982–86

Service			No. of Lines/ subscribers	82	83	84	85	86
Non-telephone-based Services	DDX services	Packet switching services	Lines	758	3,007	6,626	14,158	27,802
		Growth over previous year	Growth	–	4.0	2.2	2.1	2.0
		Circuit-switched services	Lines	770	1,595	2,677	3,991	5,221
		Growth over previous year	Growth	–	2.1	1.7	1.5	1.3
	Facsimile services		Subscribers	2,603	9,551	18,214	46,271	85,234
		Growth over previous year	Growth	–	3.7	1.9	2.5	1.8
	Videotex services		Subscribers	–	–	5,233	12,042	26,735
		Growth over previous year	Growth	–	–	–	2.3	2.2
Telephone services			Subscribers (in tens of thousands)	4,150	4,288	4,396	4,530	4,677
		Growth over previous year	Growth	–	1.03	1.03	1.03	1.03

phone services.

Digital data exchange services

Digital data exchange (DDX) services utilize digital transmission and switching technologies to make possible high quality, economical digital data transmission. Depending on the telecommunication method employed, DDX services can be either circuit-switched or packet switching services.

DDX circuit-switched services are similar to telephone services in that they require that a physical circuit (transmission path) be established between two terminals that operate at the same speed each time a transmission is made. The transmission path utilized must be a digital channel, i.e. channels capable of transmitting data in digital form without having to convert between digital and analog, within which data transmitted at various speeds can be multiplexed using time-division multiplexing techniques. Utilization charges for DDX circuit-switched services are calculated based on the amount of time the circuit was used in the transmission process (the duration of the call).

DDX circuit-switched services are used in online networks to transmit large volumes of data in short periods of time, as well as for high-speed file transmission operations. However, the sudden growth of dedicated (leased line) services has

kept the growth of circuit-switched services low compared to other non-telephone-based services being offered. In future, DDX circuit-switched services are scheduled to be converted into ISDN services, which commenced operation in 1988.

The special feature of DDX packet switching services is the manner in which the data handled in these services is transmitted and received. For example, the data being transmitted online is first divided into segments or packets that are a maximum length of 256 octets (an octet is a unit of data consisting of 8 bits), then each of these packets is affixed with a header containing the address of the receiver of the data. This packetized data is stored briefly in the packet switching exchange prior to being forwarded to the addressee (the recipient of the message). With DDX packet switching services, error control operations are performed for every packet transmitted,

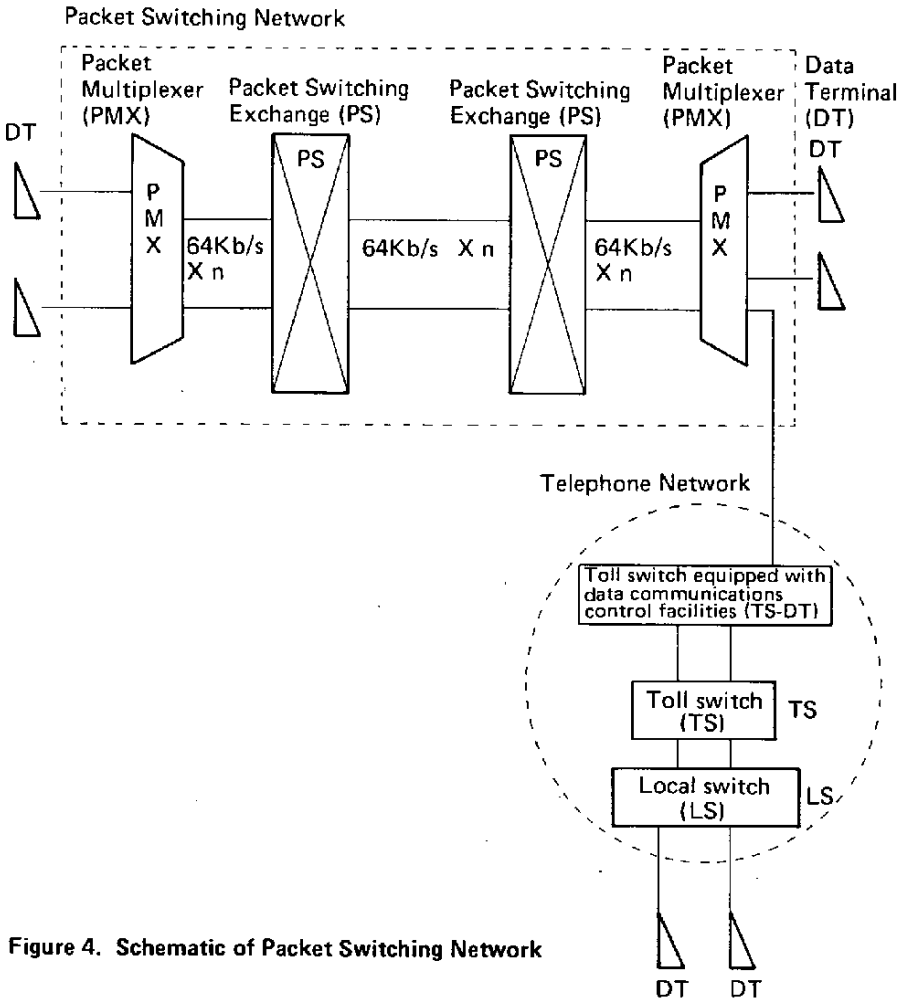


Figure 4. Schematic of Packet Switching Network

making possible very high quality transmissions. Figure 4 provides an overview of DDX packet switching services. Utilization charges for packet switching services are calculated per packet on a volume and distance basis, with the difference between local and long-distance transmissions working out to a mere 1:15.

As a result of packet switching service fees being calculated on a volume basis, these services are used mostly by customers who transmit a lot of small messages to various different locations. In 1985, NTT began offering packet switching services provided over the telephone network, and demand for these services has increased considerably since then. NTT plans to offer packet switching services via the ISDN beginning in the spring of 1989, a move the company expects will give a real boost to overall demand for these services.

Facsimile network services

The spread of facsimile utilization in Japan as a means of transmitting textual information has been fantastic. However, when facsimile operations are carried out over the telephone network, charges must be calculated the same as for telephone calls, transmission speeds can not be increased and storage functions are limited to those available in the terminals themselves. For these reasons, NTT constructed a dedicated facsimile network separate from its ordinary telephone network to provide facsimile transmission services. This facsimile network is equipped with digital transmission paths and digital storage switches. The construction of a separate facsimile network makes it possible to provide facsimile services at reasonable rates. It also enables the network itself to be equipped with various functions for the provision of volume, multi-point facsimile transmissions, timed-storage services and facsimile-to-computer communication services.

Videotex services

The first videotex service in Japan was the nationwide CAPTAIN service begun by NTT in 1984. The CAPTAIN system is based on a format developed in Japan, and features reinforced image display functions. Demand for CAPTAIN services to date has not grown at the rate initially anticipated. NTT is therefore busy enhancing the systems retrieval procedures, and formatting information that will prove more useful to the average household user. These and other improvements to the CAPTAIN system are expected to spur future demand.

Regional videotex systems, employing either the CAPTAIN or NAPLPS formats, are being constructed throughout Japan. In fact, there is an average of one regional videotex center in each of Japan's 47 prefectures. These local videotex systems are serving as the core of the information revolution in outlying areas of Japan.

High-speed digital leased line services

As their name implies, high-speed digital leased line services provide users with broadband circuits capable of transmitting large volumes of digitalized data at speeds ranging from 64K bits per second (bps) to 6.3M bps. Quite a difference from traditional analog leased lines that operate at a base speed of 3.4 KHz. Also, since the lines leased to users transmit digitalized data from end-to-end, they are capable of handling multiple forms of data (multi-media), to include voice, still images and video.

Users of these services can construct economical corporate information networks that utilize high-speed digital leased lines between cities, and connect these digital lines to a number of local 3.4KHz analog leased lines to lower the costs of transmitting company data from one location to another in different cities.

At present, the use of leased lines to construct in-house networks and/or value-added networks (VAN) is becoming quite popular in a variety of industrial fields, which in turn is significantly increasing demand for high-speed digital leased line services.

Growth of Mobile Communications

If telecommunications is a means of overcoming the barriers of time and distance, then mobile communications is the ultimate form of telecommunications.

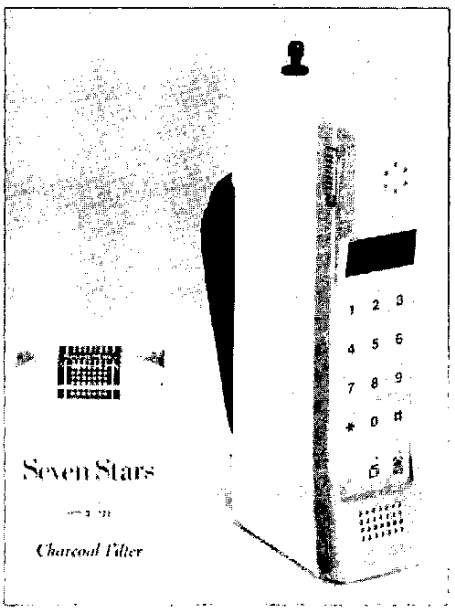


Photo 1. NTT's Portable Telephone

Table 4. Mobile Communications Services

	Service	Starting Date	Radio Frequency	No. of Subscribers ('86)	Service Area
Mobile Communication Services	Car Telephone Services	1979	800MHz	33,028 connections	506 cities
	Paging Services	1968	250MHz	2,488,000	67 regions
	Ship Telephone Services	1979	250MHz	15,806 connections	Up to 50 kilometers out at sea
	Airplane Public Telephone Services	1986	800MHz	54 planes	Up to 5,000 meters high in Japanese airspace

Table 4 provides an overview of mobile communications services available in Japan. Today, these services are being provided on land, at sea and in the air, and in 1987, compact, lightweight portable telephone sets that can be carried around wherever one goes were also marketed. Photo 1 shows a picture of NTT's portable telephone set.

The radio communications systems used to provide mobile communications services are switching from traditional analog systems to digital systems, a move that is making possible improved communications quality, large capacity transmissions and compact terminals. One task facing NTT in future will be meeting anticipated demand for non-telephone-based service applications in the mobile communications field as well.

Another task NTT has to come to grips with is the competition being generated in this field. Paging (beeper) and car phone services can be furnished at a relatively small investment, and new entrants to the Type 1 carrier business (NCCs) are gearing up to provide these services. Table 5 lists the new NCC entrants to the telecom business who are offering or planning to offer mobile communications services. As indicated, there are 19 newcomers who are already providing paging services. Some of these firms are servicing local areas only, and are offering their services at rates 20% cheaper than NTTs paging services. Certain NCCs had captured 30% of local pager markets within three or four months of commencing services.

Developments in the Field of Satellite Communications

Satellite communications is really starting to get off the ground following the deregulation of the telecommunications business. Up until recently, the only commercial public communications services employing a communications satellite were a broadband digital leased line service and a 4MHz-band video transmission service offered by NTT using Japan's CS-2 communications satellite launched in 1984. However, the high

Table 5. NCCs in the Mobile Communications Business

Service Category	Company Name	Type of Service	Service Area	Starting Date
Mobile Telephone Services	Nippon Ido Tsushin Corp.	Car and portable telephone	Tokyo, Kanagawa, Saitama, Chiba, Ibaraki, Aichi, Mie and and Gifu prefectures	December 1988 (scheduled)
	Kansai Cellular Co., Ltd.	Car and portable telephone	Osaka, Kyoto, Hyogo, Nara, Shiga and Wakayama prefecture	April 1989 (scheduled)
	Tokyo Bay Marinet Co., Ltd.	Ship and portable telephone	Tokyo bay and surrounding coastal areas	September 1988 (scheduled)
Paging Services	Kyushu Network Systems Co., Ltd. and 18 other firms			

costs of satellites and ground stations, considerations concerning reliability and the late development of applications kept utilization of satellite communications services low compared to other, terrestrial telecom services.

Beginning this fall, CS-3, a large-capacity national communications satellite is scheduled to begin operations, replacing the old CS-2 satellite. In the spring of 1989, two NCCs are scheduled to commence satellite communications services using two additional large-scale satellites. In future, competition in the satellite communications business is expected to result in lower utilization costs and the development of applications that take advantage of the special characteristics of communications satellites, i.e. rapid response time, multi-point transmission capabilities and wide area coverage. When this happens, satellite communications will develop into a multi-media service, integrating voice, data and image communications capabilities. Refer to Table 6 for an overview of the communications satellites currently in operation over Japan, and those scheduled to go into operation in the near future.

FUTURE DEVELOPMENT TRENDS

As pointed out above, telecommunications in Japan have progressed from the era when simply fulfilling basic user telephone needs was enough, into the age where demand for data, facsimile and image communications, the so-called new media, can not be met using the old analog telephone network, thus requiring that new digital networks be constructed to provide these services.

Telecommunications of the future will necessarily spring forth from developments made today, but competition and the speed at which technological advances are taking place make it hard to predict exactly what the future holds for the field of telecommunications. But it is clear that digital technology is paving the way for integrated telecommunica-

Table 6. Overview of Communication Satellite Capabilities in Japan

Item	In Use		Scheduled for Launching	
	CS-2	CS-3	JC-SAT	SCC
Principal Operator	NTT	NTT	Japan Communications Satellite Co., Inc.	Space Communications Corporation
Start of Service	84. 11	88. 3/88. 7	89. 2/89. 7	89. 6/89. 10
Frequency Band	C and Ka bands	C and Ka bands	Ku band	Ku band
No. of Transponders	8	12	32	29
Remarks	CS-3 will replace CS-2 in fall 1988.			

tions networks, and that we are heading toward the era of ISDN. The coming of the ISDN era will be precedented upon the digitalization of all switching equipment, relay transmission circuits and user terminals and equipment. For this reason, NTT is striving to convert all of its switching and relay transmission circuits to the digital mode by the 1990's (See Figure 5).

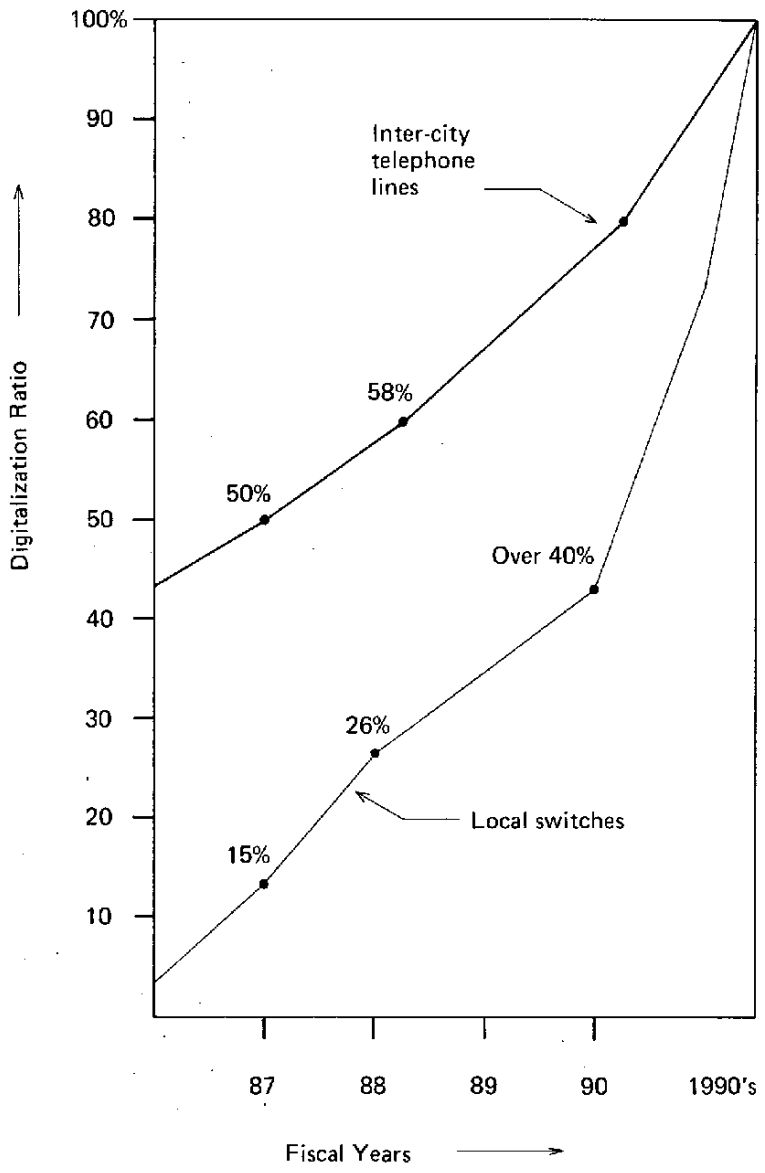


Figure 5. Rate of Digitalization

ISDN services based on the international standard I interface were commenced in Japan in April of this year. These services are provided over a digital network, which could serve as the infrastructure for expanded international telecommunications services. By linking Japan's ISDN services up with those being put into operation in other countries around the world, Japanese telecommunications services can be made available on a global scale.

But just what direction will developments in the telecommunications field take in the ISDN age? Let's look at the possibilities not from the standpoint of individual services, but rather from three major technological-service trends.

The first major trend is toward high-speed transmission. In order to transmit larger volumes of data, high-speed digital communications technologies are being incorporated into transmission circuits and switching equipment. In fact, we believe that the time when broadband video communications services such as teleconferencing can be offered at extremely reasonable rates is not too far off. Also, high-speed packet switching technology will not be limited to the field of data communications alone, but rather is also expected to find applications in the communication of voice and image data as circuit-switched and packet switching services continue to merge together in future.

The second major trend to watch is that toward multi-media communications. The access to integrated services provided via ISDN will combine with the high-speed packet switching technologies mentioned above to advance the state of the art to the point where data can be communicated in any form whatsoever. In other words, ISDN will enable the provision of services that transmit information without regard for the media involved, be it voice, text, facsimile or images. This trend will inevitably merge today's various independent services and networks into a single integrated services network.

The third trend is toward more intelligent machines. Intelligent machines and equipment are being made possible by the increasing fusion of telecommunications and information processing technologies. The combination of advanced technologies such as artificial intelligence (AI) and database technologies with telecommunications will make possible the realization of convenient, user friendly communications networks. Making communications networks smarter should enable the provision of a variety of telecommunications services that have only been dreamed of up until now, such as mechanical translation, automatic call tracing and voice dialing services for telephone users, as well as online IC card services. These kinds of services require sophisticated data processing capabilities, but once realized, will enable telecommunications that truly overcome the limitations placed on human communication and interaction by distance, time and media format.

The preceding section has attempted to summarize NTT's thinking on the future course of network services in Japan.

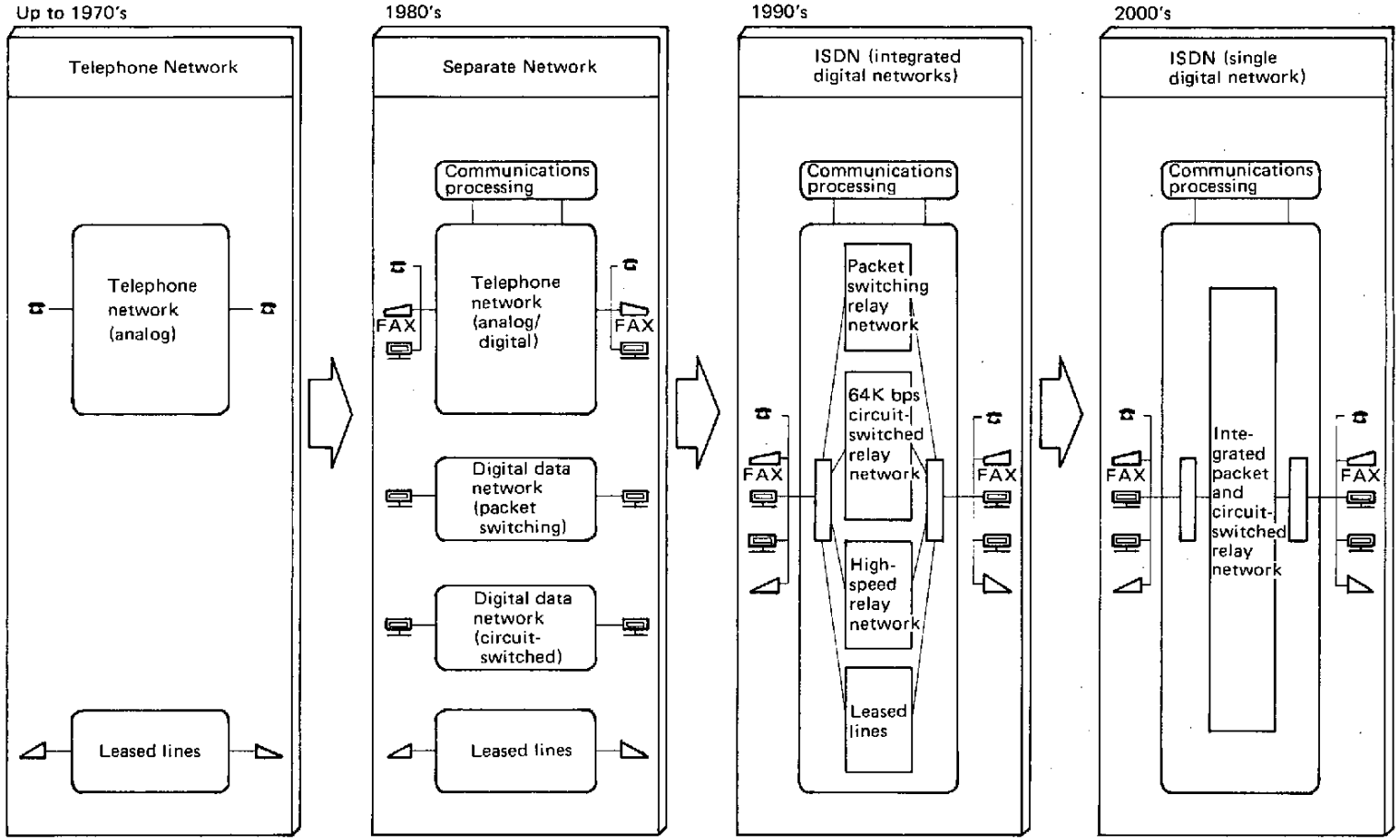


Figure 6. Network Service Development: Past and Future

These ideas are illustrated in Figure 6.

CONCLUSIONS

This report has attempted to describe the current state of telecommunications services in Japan, and to outline NTT's thinking on how these services can be expected to develop in future. The future development of telecommunications services in Japan will be supported by more substantial research and development work in the fields of telecommunications and data processing; by the competition among NTT, the NCCs and other new entrants to the telecom business, and the creativity in the form of new products and services in anticipation of market needs that this competition will spawn; and by efforts at international cooperation. This kind of continued effort is the responsibility of NTT and the other members of the telecommunications business in Japan for the ultimate realization of a "global network."

JAPAN'S INTEGRATED SERVICES DIGITAL NETWORK

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ISDN: CONCEPTS AND SPECIAL CHARACTERISTICS

ISDN And "INS Net" Services

Today, as we approach the 21st Century, Japan and numerous other nations around the world are steadily moving toward the realization of advanced information societies. Integrated services digital networks (ISDN) are vitally important infrastructures for building advanced information societies, and Nippon Telegraph and Telephone Corporation (NTT) has been working hard for some time now to make ISDN the core of its telecommunications services. Between September 1984 and March 1987, NTT tested an ISDN model system in the Musashino-Mitaka area of Tokyo. In addition to checking out the 64K bits per second (bps) digital telecommunication technology incorporated into this model system, NTT also used the test system to evaluate various services and to determine what forms of utilization users wanted most. In December 1986, NTT also commenced testing an intercity ISDN extending from Tokyo to Nagoya and on to Osaka. This second experimental system was put together primarily to develop new ISDN applications with the help of system users.

While all this was going on in Japan, headway was being made elsewhere toward the internationalization of telecommunications. The International Telegraph and Telephone Consultative Committee (CCITT) has made considerable progress on international standards for ISDN, and has set forth conditions for the actual provision of ISDN services.

Under these circumstances, and based on users' needs and the results obtained from its two test systems described above, on April 19, 1988, NTT began offering its "INS Net" services, ISDN services that conform to international standards.

INS Net Services: Interfaces and Provision Plans

NTT will provide two types of INS Net services: INS Net 64 and INS Net 1500. INS Net 64 consists of services Provided using the ISDN basic interface, whereas INS Net 1500 services will be provided using the ISDN basic interface, face.

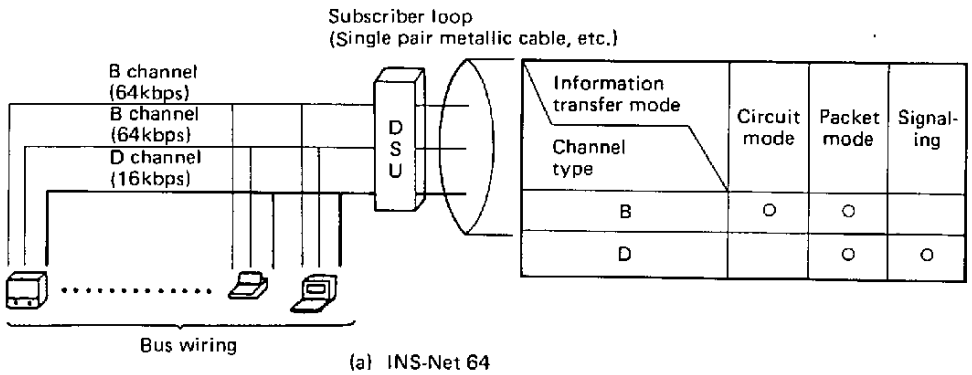
The ISDN basic interface has two information channels (64K bps B chan-

nels) and one signaling channel (16K bps D channel). The B channels are used to provide either circuit-switched or packet switching services, while the D channel is used for signal reception and packet switching services.

The primary rate interface is comprised of 23 B channels and one 64K bps D channel inside a single 1.5M bps cable. The B channels can either be divided into separate 384K bps data channels (H_0 channels), or can be used together as a single 1.5M bps data channel (H_1 channel). Both the H_0 and H_1 channels can be employed for circuit-switched services (See Figure 1).

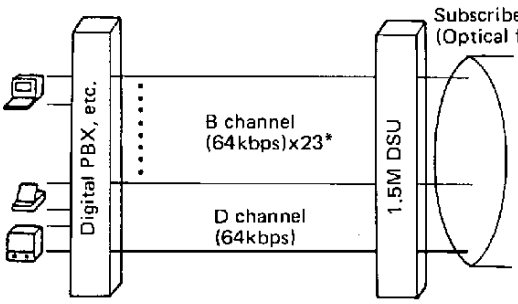
The ISDN service started by NTT on April 19, 1988 was the INS Net 64 circuit-switched service. NTT is currently providing this service in Tokyo (23 wards), Nagoya and Osaka. INS Net 64 commenced operations with 29 users employing 114 lines, but as of June 30, was providing services to 56 users over 221 lines.

NTT hopes to make this service available to users nationwide as soon as possible, and by the end of fiscal 1988, plans to expand INS Net 64 to major cities



Information transfer mode / Channel type	Circuit mode	Packet mode	Signaling
B	○	○	
D		○	○

(a) INS-Net 64

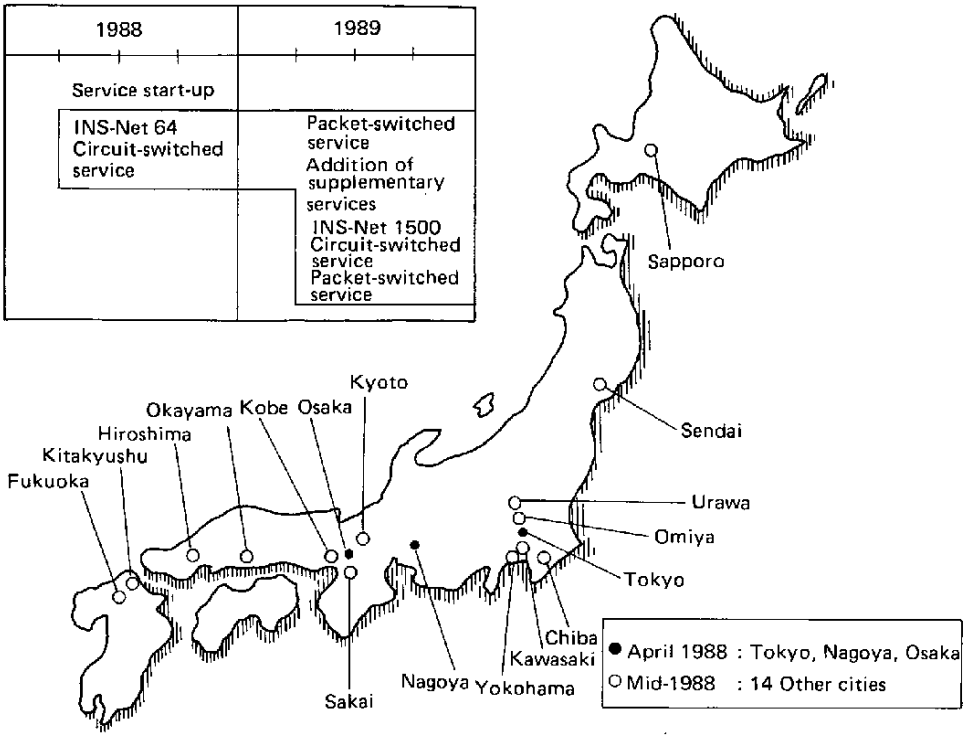


Information transfer mode / Channel type	Circuit mode	Packet mode	Signaling
B	○	○	
H_0 384kbps	○		
H_1 1.5Mbps	○		
D		○	○

*With joint use of the D channel of another interface, it becomes possible to supply 24 B channels.

(b) INS-Net 1500

Figure 1. Conceptual View of INS-Net Services



*Planning is underway for the expansion of INS-Net Services to other major cities by Mid-1988.

Figure 2. Planned Expansion of INS-Net Service Provision

throughout Japan.

By spring of 1989, NTT's plans call for the company to add packet switching services to its INS Net 64 menu, and to begin provision of INS Net 1500 services as well (See Figure 2).

The three areas (Tokyo, Nagoya and Osaka) to which NTT is currently providing INS Net 64 circuit-switched services are hubs of Japanese administrative and economic activity, and account for 8.6 million, or 19% of the total number of telephone service subscribers in Japan. For this reason, the impact of INS Net 64 services on these three areas is bound to be great.

Special Features of INS Net Services

As pointed out above, NTT's INS Net provides ISDN services, and as such possesses the six (6) special characteristics described below.

1) A general-purpose digital public network

INS Net services are digital public network services, and enable users to communicate digitally with anyone just by dialing the appropriate numbers. When we speak of digital communications in Japan, NTT's digital data exchange

(DDX) and Super Digital services come to mind. DDX services are digital public network services that take the form of either circuit-switched or packet-switching services provided at one of seven (7) speeds, ranging from 200 to 48K bps. NTT's Super Digital services are digital leased line services offered at any one of six (6) transmission speeds, ranging from 64K to 6.3m bps. Demand for Super Digital services is growing rapidly, as indicated by the 1.8-fold year-to-year growth exhibited by these services during fiscal 1987.

Super Digital services make use of leased lines that permanently connect specified locations, and as such, charges for these services are levied at a flat rate. Charges for INS Net services, however, are calculated by the duration (utilization time) involved, and are thus levied on a meter rate basis. By combining INS Net services with Super Digital Services one could achieve economical digital communications to relatively low traffic areas.

2) High-speed, high quality transmissions

INS Net services enable high-speed data transmission capabilities ranging from 64K bps to 384K bps, and on up to 1.5M bps, making it possible to provide high-speed, high-resolution facsimile, low-speed, low resolution video and high-speed data communications.

For example, whereas it generally takes about one minute to send one sheet of letter size text via facsimile over the telephone network, that same amount of data can be sent at 64K bps in just around four (4) seconds.

3) Single line, multiple channels

Since INS Net 64 enables multiple channels to be employed over a single line, a number of different communications equipment can be hooked up and used to send different messages to different locations at the same time. It can also be used for multi-media communications in which a map or diagram can be sent to a person while you are talking to him on the phone.

4) Integrated services

Up until now, when Japanese used telephone or DDX services, separate contracts and telecom lines were required for each type of service. However, with INS Net services, just one contract and one telecom line are needed to provide users not only with ordinary telephone services, but with digital circuit-switched and packet switching services as well. Also, beginning in spring of 1989, the INS Net will be able to utilize network services provided over the existing telephone network, and to access existing facsimile and videotex networks, too (See Figure 3). Whatismore, the numbering plan for INS Net services adheres to the numbering plan used in the existing telephone network, making it possible for INS Net users to communicate with one another via the same numbering system as that employed in the telephone network.

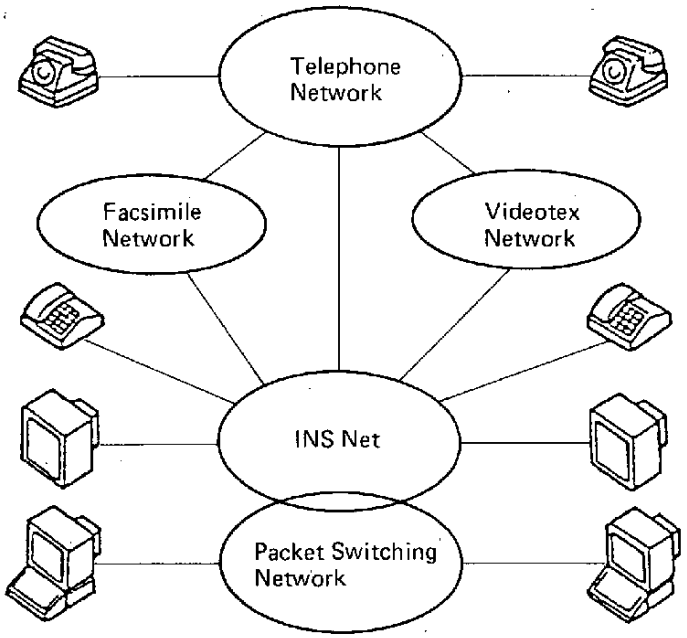


Figure 3. INS Net Links With Other Networks

Table 1. New ISDN Network Services

Service Name (Tentative)	Usage
Caller's Number Notification	This service will transmit the caller's telephone number (caller ID) to the person being called, enabling him to identify the calling party. Utilizing this service will make it possible to realize closed communications between members of the same group.
Subaddress Notification	By making use of subaddresses (extension numbers), callers will be able to specify individual telephone sets and other communications equipment inside major companies similar to PBX dial-in services.
Charge Information Notification	This service notifies callers of their charges upon completion of a communications. Rental services employing equipment with this function are also being considered.
User-to-user Information Notification	This service makes it possible to transmit simple messages (up to 128 alphanumeric characters), and can be used to transmit simple memos and/or ID numbers needed to access databases.
Incoming Call Notification	This service notifies the user of an incoming call when all information channels are in use.
In-service Terminal Notification	This service makes it possible to temporarily interrupt communications to physically move a terminal to a different location and then resume communications.

5) New services possible with ISDN

With conventional analog telephones, both information and network signals are transmitted over the same channel. But, with ISDN, separate information and signalling channels are used, making it possible to exchange signals even while the information channel is in use. Because the capacity of ISDN signalling channels is also quite large (16K bps), various signals can be transmitted and received. These factors enable ISDN to offer users new network services, such as a caller's number notification service that displays the calling party's telephone number on a small display screen built into the ISDN telephone set (See Table 1). Caller's number notification services and charge display services have been being offered via the INS Net since April 19 of this year, but the other services cited in Table 1 are not scheduled to be made available until spring of 1989.

6) User-network interface that adheres to international standards

As discussed above, INS Net services conform to internationally accepted standards, and as such, any type of terminal equipment that meets with ISDN standards can be interconnected to INS Net.

IMPACT OF INS NET SERVICES

INS Net Service Charges

The one facet of communications services that interests users more than anything else is probably the charges levied for these services. INS Net services are designed to serve as the infrastructure of the advanced information society of the 21st Century, and the spread of these services can be expected to significantly impact the nation's economy. These services must therefore be offered at rates that are reasonable and conducive to widespread utilization. INS Net service charges have thus been established at levels commensurate with current analog communications service fees, and are designed to reflect the reduced costs made possible via digitalization.

The basic rates charged for INS Net services differ for business and home users. Business users pay a basic service (access line) charge of 5,400 yen per month, whereas the basic service charge for home users is only 4,600 yen a month. Basic monthly service charges for analog telephone services at present work out to 2,350 yen for business users and 1,550 yen for home users, which means that INS Net monthly service charges are 3,050 yen more expensive for both categories. However, since one INS Net telecom line can be used to transmit calls for two existing analog telephones, plus make possible both digital circuit-switched and packet switching services, these rates are actually extremely inexpensive by comparison.

INS Net utilization rates are the same as present telephone rates for both digital and telephone mode transmissions. More specifically, INS Net communication rates for local transmissions (within a certain unit fee area) work out to 10 yen for three minutes, and long distance

Table 2. Charge Rates for INS-Net 64 Services

	INS-Net 64 (circuit-switched)	
	Telephone communications mode	Digital communications mode
Subscription Fee	800 yen	
Access Line Charge	Business-use 5,400 yen; Residential-use 4,600 yen	
Call Charge	Same as ordinary (analog) telephone rates	Same as ordinary (analog) telephone rates

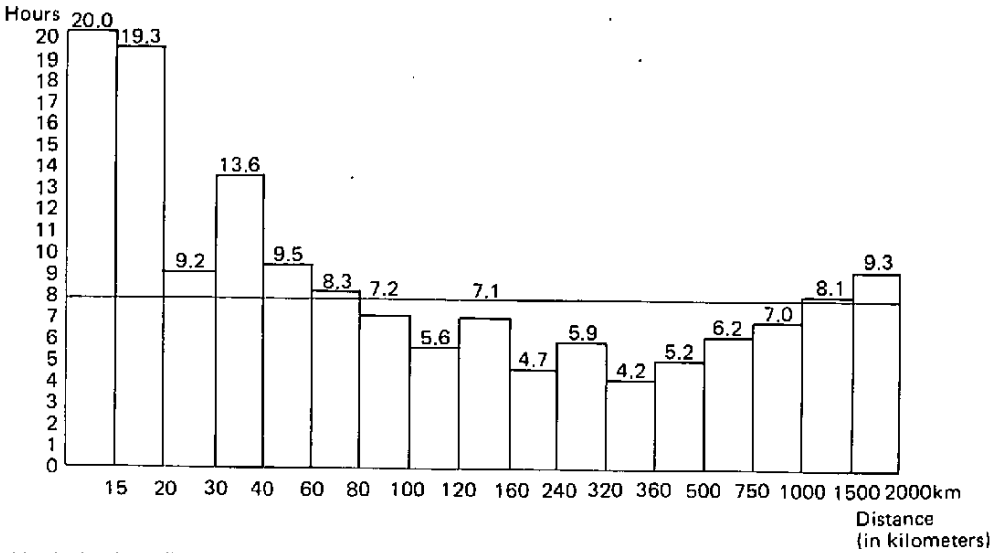
NOTE: Additional charges may need to be made for construction and installation.

transmissions over 320 kilometers are calculated at 10 yen for five seconds (See Table 2).

Digital Leased Line Services and INS Net 64

NTT's digital leased line service, Super Digital, was first started up in November 1984, and has grown rapidly ever since. At present, applications for Super Digital leased lines have reached the 5,000 mark. The biggest single factor contributing to this growth has been the reasonable prices charged for Super Digital services (Super Digital leased lines transmit data for approximately one-fifth the amount charged to transmit the same data via conventional analog leased lines, and carry telephone conversations at one-half the cost.). Since INS Net 64 rates are even less expensive than those charged for Super Digital leased line services, we expect INS Net 64 to be able to attract customers away from Super Digital services. However, since digital leased lines are employed in the construction of fairly large corporate communications networks, these potential INS Net 64 users will have to keep a number of points in mind besides simply the difference in utilization rates, to include such things as network security and utilization modes.

If we compare the utilization rates for Super Digital services with those of INS Net 64, we see that INS Net 64 services are cheaper to use when the amount of data transmitted is normally relatively small. This point is graphically demonstrated in Figure 4. For example, for a user who employs leased line services 25 days out of every month, INS Net 64 rates would be equal to those of Super Digital if the user transmitted at 64K bps for 20 consecutive hours every day within the same exchange area. In other words, for users who require leased line services less than 20 hours a day, INS Net 64 services are less expensive to use than Super Digital services. For long-distance



Vertical axis: indicates the minimum utilization time per day to make Super Digital services less expensive to use than INS Net services.
Horizontal axis: indicates length of circuit (distance).

Figure 4. A Comparison Of Super Digital and INS Net Charges

communications of 500 kilometers (the approximate distance between Tokyo and Osaka), INS Net 64 services are cheaper to use than Super Digital services when the average daily utilization time is less than 5.2 hours.

Around 65% of all the lines being leased via Super Digital are capable of 384K bps or faster transmission speeds. Therefore, NTT is thinking of promoting Super Digital leased lines for use as high-speed trunk lines and INS Net lines for use as the local links in corporate user networks. NTT feels there is a good possiblity that users currently using 64K bps Super Digital services will switch to INS Net 64 services since roughly 70% of these users are currently employing the Super Digital lines to transmit messages over short distances of 30 kilometers or less.

Specific Utilization Plans

Although use of INS Net services is expected to grow rapidly in future as a result of the inexpensive rates charged for these services, for the time being, the INS Net system will probably be used primarily by large corporations in conjunction with their in-house communications networks, as well as by small- and medium-sized firms looking to take advantage of INS Net's public communications capabilities. Home use of INS Net services is believed to be a long way off yet. Let's look at some specific examples of how certain users plan to utilize INS Net. For instance, banks intend to use INS Net to remotely monitor unmanned cash dispenser (CD) corners located off premises, and as the online links that allows CD corner users

to make inquiries concerning their account balances. In addition, banking houses also intend to introduce ultra-high-speed G4 facsimile services into their operations using the INS Net, a plan that is expected to greatly improve the efficiency of the voluminous processing work involved in carrying out exchange operations. Japanese insurance firms are pushing forward with informatization schemes. One such firm has plans to lease high-speed digital lines interconnecting the headquarters with its branch offices, and to make use of INS Net services to form the links between its branch offices and local business offices. This will enable the company to construct an efficient digital communications network linking together its business and branch offices with the main offices at headquarters. A printing company is planning to use INS Net to link its sales division together with its printing plant to allow for the quick proofing of printed materials hot off the presses. Other plans on the drawing board call for using INS Net as a back-up system for high-speed digital leased lines, and as the communication medium for carrying out video teleconferences.

Expected Demand And Its Impact On The Economy

According to a report put together by the ISDN Terminal Development Council (an advisory body to the director of the telecommunications bureau at the Ministry of Posts and Telecommunications (MPT)), INS Net services are expected to form the basis of next generation communications, thus having a considerable impact on social and corporate activities. That is, networking is making rapid progress in the world of industry, with in-house networks steadily evolving into inter-company networks. The purpose for networking is also changing, from the rationalization of corporate activities to make them more efficient, to the creation of new investment services that make the most of data communications functions. Under these circumstances, the outstanding functions and cost saving inherent in INS Net services are expected to contribute positively toward their utilization in the construction of advanced data communications systems and the effective use of office automation (OA) equipment. This in turn is seen as further promoting networking inside industry, and contributing greatly toward the development of the nation's economy.

INS Net services are also expected to improve daily life in Japan by making possible the efficient utilization of a variety of database and other information retrieval services, and enabling the provision into the home of integrated communications services such as TV phones that fuse together voice and video data. INS Net services are also expected to make it possible to access and use information inexpensively from outlying regions, thus overcoming problems related to distance. This will correct the information gap that exists between Japan's major metropolitan areas and outlying regions, and will promote the more even distribution of business throughout Japan.

Estimates put forth by the ISDN Terminal Development Council predict that if INS Net services grow as expected a total of 20 trillion yen will be needed in future to invest in network construction, the development of database and various other services that use INS Net and the development of INS Net terminal equipment (the latter of which alone will require 12.5 trillion yen). The Council also predicted that by the year 2000 the use of INS Net services will have grown 18% overall, with industry seen as growing 70%, and the home market as exhibiting a 10% growth rate.

CONCLUSIONS

Up until now, studies related to the network aspects of ISDN have taken precedence over ISDN services-related studies in Japan. But the commencement of INS Net 64 services in April of this year fulfilled the conditions necessary for the provision of network services, and the start of INS Net 1500 services and packet switching services in spring of 1989 will finally put ISDN in full swing. In order to make the most of the enhanced features built into ISDN services and to provide convenient services that meet the increasingly advanced communications services requirements expected in future, it will be extremely important to develop terminals and services that systematically incorporate users' needs, wants and opinions. It will also be necessary to construct the digital networks needed to support ISDN, and to rapidly expand the areas to which ISDN services can be provided. And finally, it is urgent that we use ISDN to promote access to communications services on an international scale.

REALIZATION OF INTERNATIONAL VAN

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TELECOMMUNICATIONS BUSINESS LAW

The implementaion of the Telecommunications Business Law in April 1985 opened the door to the entry of the private sector into the world of telecommunications, a field which had previously been the monopoly of the then Nippon Telegraph and Telephone Public Corporation (since privatized and renamed the Nippon Telegraph and Telephone Corporation (NTT)) and the Kokusai Denshin Denwa Co., Ltd. (KDD). This move was designed to interject new blood into the telecommunications business in the form of private carriers and telecom vendors, thereby hopefully stimulating business and enhancing efficiency, while at the same time increasing the benefits and covenience of telecommunications for users.

The competition that has arisen among newly established telecom carriers and vendors, both in the domestic and international arenas, is creating a variety of new telecom services to fulfill users' requirements (International telecommunications, of course, must pay heed to pertinent international laws and regulations, as well as relationships with other countries.).

So as to make possible a flexible approach to future advancements in telecommunications, the Telecommunications Business Law distinguishes between telecom businesses on the basis of whether or not they possess their own telecommunications circuits and related facilities. Consequently, telecom businesses have been divided into two broad categories: Type 1 telecom businesses, which operate using their own circuits and facilities; and Type 2 telecom businesses, which provide telecom services by leasing circuits and other facilities from Type 1 firms.

Following the liberalization of telecommunications regulations with the implementation of the Telecommunications Business Law, over 500 Type 2 telecom businesses have entered the domestic market for telecom services, i.e. the domestic value-added network (VAN) market. These domestic VAN firms are engaged in cut-throat competition to attract and retain customers.

The implementation of the Telecommunications Business Law also made it possible, in theory, for Type 2 telecom vendors to engage in the provision of international telecom services, commonly referred to as international VAN serv-

ices. However, whereas Japan's revised telecom legislation eliminated domestic barriers to the provision of international VAN services, Recommendation D.1 of the International Telegraph and Telephone Consultative Committee (CCITT) prohibits leasors of international dedicated circuits to resell those circuits to unspecified third parties for applications other than data processing services. For some time, therefore, the only international VAN services that Japan's Type 2 telecom businesses could offer were those provided via the international telephone and/or the international public switched networks, i.e. public switched telephone networks and packet switching data networks. For all practical purposes, the door to the realization of international leased-line VAN services was closed to these firms.

HEIGHTENED DEMAND FOR INTERNATIONAL VAN SERVICES

However, a sudden trend toward internationalization manifested itself as more and more Japanese firms expanded their operations overseas and entered into business transactions with foreign firms in response to the internationalization of Japanese financial operations and the sudden rise in the value of the yen against the dollar. This trend was accompanied by a growing demand for international telecommunications and more advanced and varied types of telecom services. Under these conditions, both Type 2 telecom vendors and their users began calling for international VAN services.

Meanwhile, U.S. representatives to the Market-Oriented Sector Specific (MOSS) talks between the U.S. and Japanese governments made a strong request to Japan to open the market for international VAN services. Consequently, after about a year's worth of government-level discussions, the two countries reached an agreement in March 1987 on the legal aspects of international VAN services, the relation between international telecom businesses and international laws and regulations, the interconnection of data communication networks and the diversification of telecom circuit utilization.

AMENDMENT TO THE TELECOMMUNICATIONS BUSINESS LAW

Based on the government-to-government agreement between the U.S. and Japan mentioned above, Japan found it necessary to partially amend its Telecommunications Business Law. This amendment went into effect as of September 1, 1987.

Generally speaking, this amendment consisted of three major parts: 1) the observance of international telecommunications treaties and related agreements; 2) the provision of non-tariff-based circuits; and 3) the guarantee of equitable network interconnection.

Observance of International Telecommunications Treaties

The first part of the amendment to the Telecommunications Business Law stipulates that the Minister of Posts and Telecommunications can order Type 1 and Type 2 telecom businesses to improve their operations in observance of international telecommunications treaties and other related agreements. This portion of the amendment sets the stage for Type 1 carriers and Type 2 telecom vendors, especially those engaged in the provision of international VAN services, to be recognized internationally as telecommunications vendors.

Non-tariff-based Circuit Provision

The second major point of the amendment makes it possible for Type 2 telecom vendors (international VAN vendors) to use circuits on a non-tariff basis, i.e. on an individual contract basis. The terms and conditions of these individual contracts are subject to government approval. Circuits provided on a non-tariff individual contract basis are considered different from international private leased circuits provided on a tariff basis. This concept creates a category of international circuits that fall outside the realm of CCITT's Recommendation D1.

Equitable Network Interconnection

The third major point of the amendment to the Telecommunications Business Law expands the original stipulation that only permitted networks operated by Type 1 carriers to be interconnected to one another to include networks operated by Type 2 telecom vendors as well. This portion of the amendment makes it possible for international VAN networks to interconnect with domestic networks, thus broadening the scope of networks with international communications capabilities.

In addition to this amendment to the Telecommunications Business Law, and prior to the commencement of international VAN services in Japan, MPT also laid down guidelines defining the scope of enhanced communications services capable of being provided by international VAN vendors using non-tariff-based circuits. These guidelines are as follows:

[1] International VAN vendors can provide any one of the following types of functions:

1) code/format conversion functions;
2) protocol conversion functions (in addition to that between X25 and X75 protocols);
3) message store and forward functions (However, either code/format or protocol conversions functions must be used in conjunction with message store & forward functions when a stored message is automatically forwarded to a terminal.)

[2] However, even if international VAN vendors elect to provide these functions, they are still not permitted to provide communications between telephone, telex or facsimile terminals.

Thus, compared to the telephone,

Table 1. List of International Special Type 2 Telecom Vendors

Company Name	U. S. Partner	Date Registered	Date Services Started
N E C	G E	September 29, 1987	December 18, 1987
Network Information Services	McDonnel Douglas (TYMNET)	September 29, 1987	December 18, 1987
JAPAN ENS	AT&T, CompuServe	September 29, 1987	January 27, 1988
Global VAN Japan	Telenet	September 29, 1987	February 29, 1988
Nihon Keizai Shimbun	Nihon Keizai Shimbun America	October 31, 1987	May 6, 1988
Mitsui Knowledge Industry	C S C	October 19, 1987	May 11, 1988
NRI & NCC	Nomura Computer Systems America	October 9, 1987	May 17, 1988
Hitachi Information Network	McDonnel Douglas (TYMNET)	September 29, 1987	–
Japan Information Services	JAIS USA	October 19, 1987	–
IBM Japan	IBM	October 27, 1987	–
NI+C International	MCI International Telecommunications	May 18, 1988	–

telex and other basic services provided by Type 1 carriers, Type 2 international VAN vendors can be expected to provide more advanced, diversified enhanced communications services.

Within the legislative framework described supra, the provision of international VAN services between Japan and the U.S. has been realized. As of the end of July, 1988, eleven (11) firms had registered with MPT as International Special Type 2 telecom vendors (international VAN vendors employing international dedicated circuits to provide services), of which seven (7) have already commenced services (See Table 1).

FUTURE OUTLOOK

Now that international VAN services have been realized between Japan and the U.S., the Japanese Government is pushing ahead with talks with the United Kingdom. As of May, 1988 the governments of Japan and the United Kingdom had reached an agreement for the provision of international VAN services between the two countries in accordance with a similar framework as that worked out between Japan and the U.S.

Japan is also holding government-level talks with France regarding the provision of international VAN services, and is looking forward to gradually expanding these services to numerous other countries around the globe.

In conjunction with bilateral talks, however, efforts must also be made to work out a global framework for the provision of international VAN services. At the next World Administrative Telegraph and Telephone Conference (WAT-

TC) scheduled to be held starting the end of November 1988, a proposal for new regulations which will determine the future course of international telecommunications is supposed to be deliberated on. These deliberations are also expected to establish a place for international VAN services in the overall development of telecommunications.

CONCLUSIONS

Recent revisions to Japan's Telecommunications Business Law set forth the framework for the realization of international VAN services, but the contents of these services remain to be steadily worked out by the international VAN vendors who will be providing them.

The future market for international enhanced communications is expected to develop along the lines dictated by the creative energies of the international VAN vendors and the various and diverse advanced services they provide, services that should both reflect the current communications needs of users while at the same time giving rise to new communications requirements.

NIS's INTERNATIONAL VAN

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Sales Department 2
Network Information Services Co., Ltd.

Network Information Services Co., Ltd. was granted an international network identification number (DNIC 4406) from the Ministry of Posts and Telecommunications (MPT) on December 17, 1987, thereby becoming the first officially recognized international value-added network (VAN) services vendor in Japan. NIS immediately finalized an agreement with America's largest VAN services firm, TYMNET, and began offering a wide variety of highly-reliable VAN services between Japan and the United States.

As shown in Figure 1, NIS's international VAN services are provided over a network that links the company's domestic network, interconnecting more than 30 cities throughout Japan, with TYMNET's international network, which covers 600 some cities inside the United States and can be accessed from over 70 countries around the world.

The same communication protocols that are used inside Japan and the United States can be utilized to provide international VAN services between the United States and Japan. That is, everything from standard protocols like X.25 and asynchronous protocols like X.28 to the various mainframer's protocols employed within Japan and the United States can be used to provide users in both countries with international VAN services (See Table 1).

International VAN services currently being provided between Japan and the United States can be broadly divided into three (3) categories: international information processing services; international store & forward services; and international online services.

International information processing services are provided via McDonnel Douglas Corporation's remote computing system which extends to countries around the world. These services are used primarily to process international order placement and receipt transactions. McDonnel Douglas is TYMNET's parent company.

International store & forward services are divided into an international electronic mail service and an international data interchange system. The electronic mail service, which is provided by NIS, is called OnTyme, and is used to send messages between Japan and the countries around the world. This international electronic mail service can also be used to transmit telex messages. The international data interchange system (IDI) makes use of McDonnel Douglas's remote computing system to store and forward

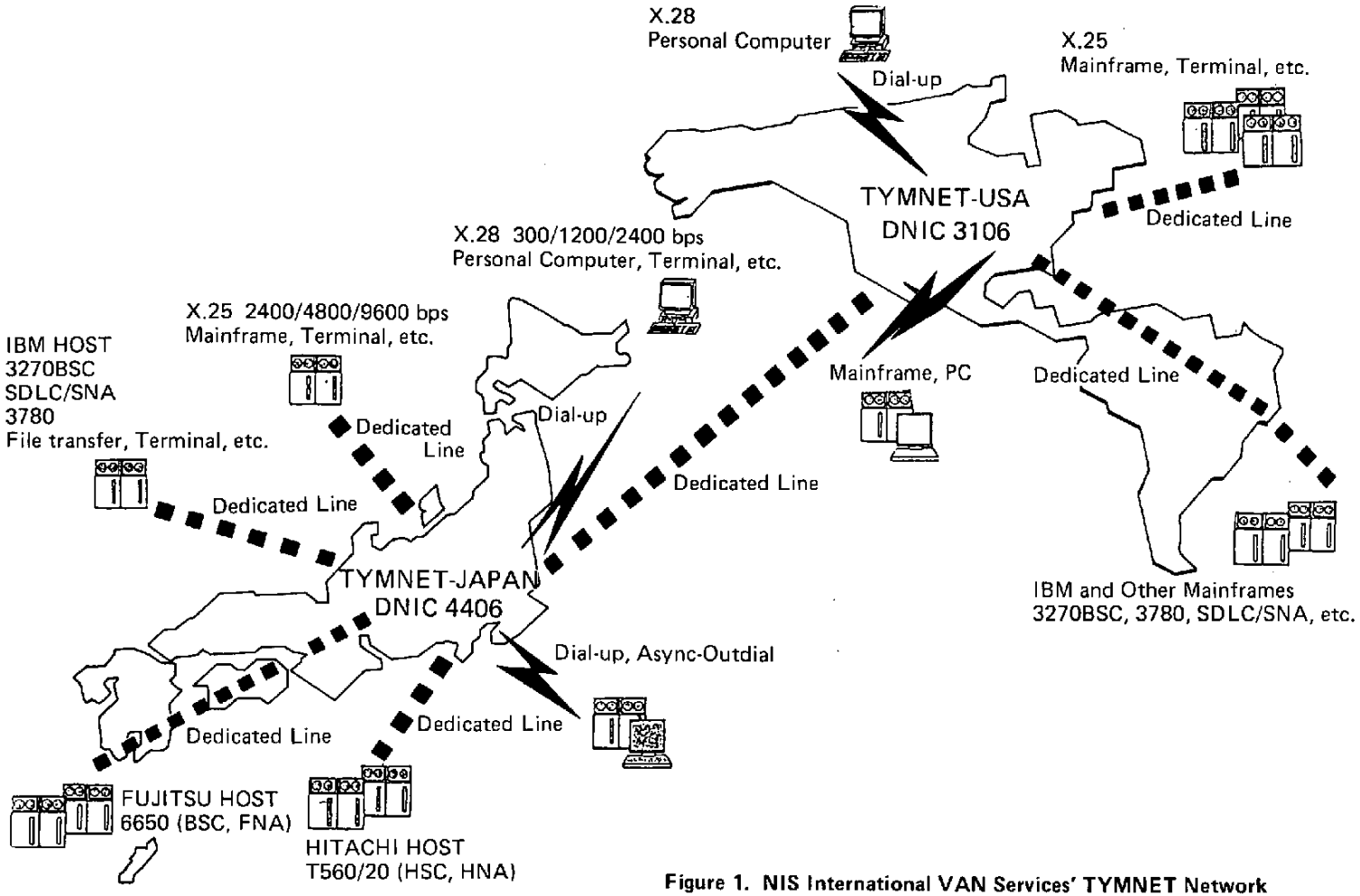


Figure 1. NIS International VAN Services' TYMNET Network

Table 1. NIS International VAN Service Protocols

	Tymet-Japan Protocols	Tymet-USA Protocols
Standard Protocols	X.25	X.25
	X.25	Asynchronous (X.28)
	Asynchronous (X.28)	X.25
	Asynchronous (X.28)	Asynchronous (X.28)
Mainframer's Protocols	IBM 3270 BSC	IBM 3270 BSC
	FUJITSU 6650 BSC	
	HITACHI T560/20 HSC	
	IBM 3270 (BSC, SNA)	Asynchronous (X.28) (DEC VT100, VT80)
	FUJITSU 6650 (BSC, FNA)	
	HITACHI T560/20 (HSC, HNA)	
	Asynchronous (X.28) (DEC VT100, VT80)	IBM 3270 BSC, IBM SNA
	IBM SDLC	IBM SDLC
	IBM 3780	IBM 3780

a variety of different types of data, to include order placement and receipt, financial, shipping, bill of lading and computer aided design and manufacturing (CAD/CAM) data.

International online services enable users to access TYMNET-USA and TYMNET-JAPAN database and electronic mail host computers, and also make it possible for members of the same company or corporate group to access each others' computers in the U.S. and Japan.

The types of database and electronic mail systems accessible from Japan via TYMNET-USA include DIALOG, Compuserve, BRS, Dow Jones and several hundred other databases, plus MCI Mail, EASY LINK and DIALCOM electronic mail services. Conversely, users in the U.S. can use NIS's international online services to access TeleStar, EYE-NET, TWICS and other databases in Japan. These services are categorized into personal and corporate services. Personal international online services are called TYMPAS. Since TYMPAS services are most often used by individuals at night after they return home from work, night-time utilization rates are lower than daytime rates. Corporate-oriented online services are called PEGASUS-PC, and because these services are used primarily during working hours, the service charge system is set up to make daytime use more economical.

Therefore, NIS international VAN services offer users a number of different access and utilization modes to choose from. The two most often used services are file transmission and online communications. However, there is a growing trend among users to mix the various types of services together, using them interchangeably to handle their different application needs. This tendency is especially strong among Japanese users.

For example, Japanese companies, especially manufacturing firms, usually begin by using IDI or OnTyme store and forward services to transmit data back and forth between their head offices in Japan and their subsidiaries and/or branch offices in the U.S. This is because of the time difference between the two countries. When its daytime in Japan, it is night in the U.S., and unless the computers installed at the U.S. locations are set up to operate at night, data communications operations can not be carried out in the online mode. OnTyme and IDI services are therefore good starting services for Japanese firms because they allow the firms to send and receive information during working hours without having to worry about international time differences. Another special characteristic of store and forward services is that they enable the head offices' international sales divisions to make preliminary checks of orders received from overseas.

The next stage in most users international VAN service utilization is to introduce online communications services into their menus. These services are generally employed to make use of technical computing programs and/or to retrieve inventory-related information available overseas, i.e. applications that do not impact on other jobs. In these instances, domestically-developed systems must be converted into formats that can be used overseas. For example, Japanese-language titles and captions must be translated into English, and unit measurements must be converted from meters into feet and inches. At this point, depending on the type of data involved, users tend to switch from the store and forward services discussed earlier to file transmission services carried out directly between the company's or corporate group's computers installed in Japan and the U.S. In order to perform online updating operations on files stored in computers located overseas, computer systems developed in both Japan and the U.S. must be made compatible with one another. The programs required to achieve this compatibility take a long time to develop and perfect, a fact that can prove uneconomical to companies and corporate groups. For this reason, Japanese firms, manufacturing firms in particular, are expected to turn more and more to international VAN services to solve their data communications requirements. And they will probably continue to utilize a mixture of different types of services, matching the utilization mode up with the type of application involved.

By the very nature of their businesses, financial, securities and other services firms most often start right off using online communication services. This also holds true for foreign-capital firms in Japan which do not have to worry about language barriers, and so can have their computers communicate directly with the computers installed at their headquarters in the U.S.

NIS intends to expand its international VAN services network in future, and the United Kingdom is the first country we would like to extend our services to. After that, we plan to expand our services to each of the 70 countries already capable of accessing TYMNET. Of these, we

would like to expand into Southeast Asia as soon as possible in compliance with strong requests from our users to do so.

NEC'S INTERNATIONAL VAN
– INTERNATIONAL MARK*NET SERVICE –

Takashi Nagai
System Manager
VAN Sales Promotion Department
NEC Corporation

OVERVIEW OF NEC'S INTERNATIONAL NETWORK SERVICES

Tie-up With GE

NEC Corporation offers global teleprocessing services in the form of its C&C VAN International Network Services. These network services, which comprise international information processing services and other specialized teleprocessing services, are the product of a sales and technical tie-up with America's GE Corporation, a leader in the field of international teleprocessing services with over 20 years experience.

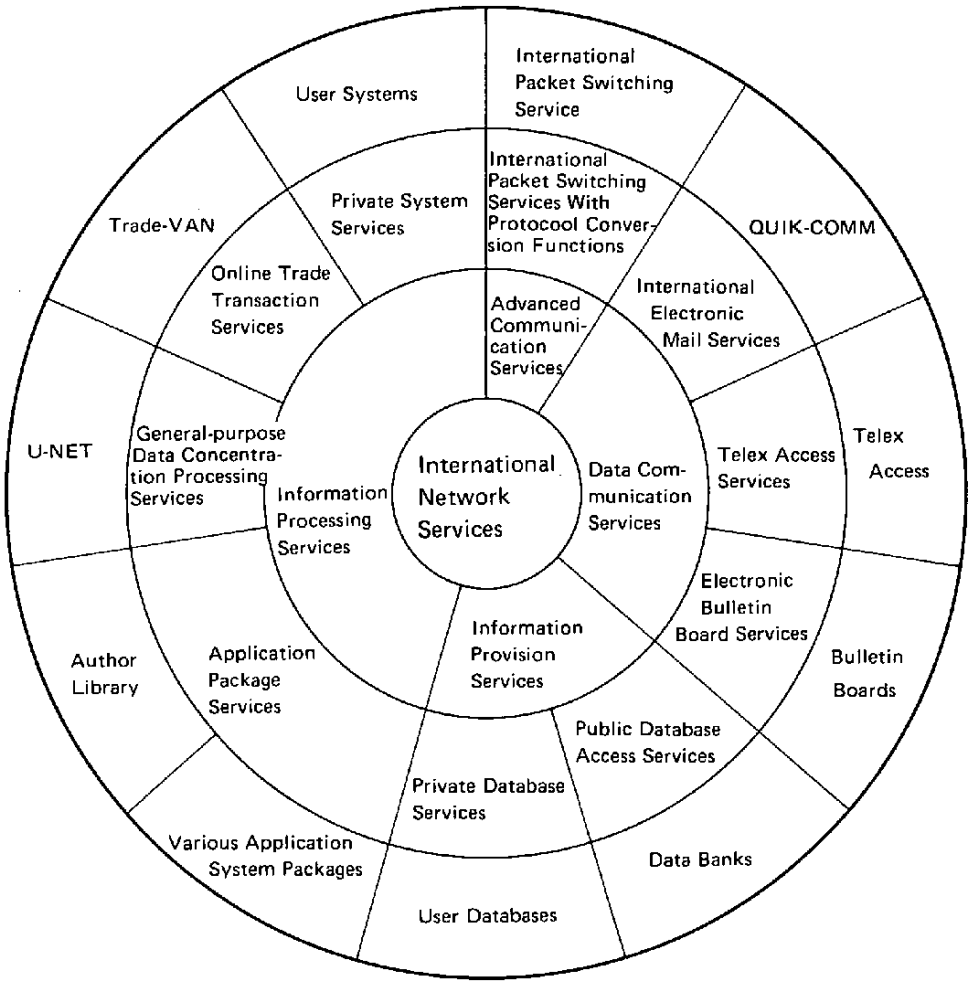
Services

NEC provides a variety of international network services to customers in almost every nation and region of the world. These services are based on the company's C&C service concept, i.e. the provision of services via comprehensive products that merge communications and information processing technologies. Figure 1 presents the various types of services offered via the company's C&C VAN International Network Services.

International Network Structure

The network used to provide these services can be roughly divided into two categories: domestic and international services. The domestic segment of this network is NEC's own C&C VAN network, called NEC-NET. The international portion of the network is owned by GE Corporation, and comprises the GEIS network, called MARK III and MARK*NET network, which interconnects 750 cities in 70 countries around the world via international leased lines (including satellite links).

The core of the MARK*NET network is comprised of NEC's C&C VAN Center located in Abiko, Chiba Prefecture, and GE's Supercomputer Centers. The GE centers are equipped with two different host delivery systems, called the MARK III Service and the MARK 3000 Service, respectively. Japanese users of these services access the network via NEC-NET, and overseas users access it via MARK III or MARK*NET. At the start of a session, users can dynamically select the host system that best meets their processing needs.



The advanced communications services indicated here are new services established upon the recent deregulation of international VAN services.

Figure 1. C&C-VAN International Network Services Menu

Data Communications Utilization Modes

Users of NEC's International Network Services can utilize these services in one of two modes. The first of these enables the user to make use of one of GE's host delivery systems (the user can choose between MARK III and MARK 3000 services) to process jobs, and the other allows the user to make use of the network alone to transmit data which he has processed himself using his own in-house host-terminal system.

The latter of these modes, the network mode, became possible with the recent

deregulation of international value-added network (VAN) communications, making possible what has come to be commonly referred to as VAN Services. NEC commenced providing VAN services called "International Packet Switching Services" in April, 1988.

POST-DEREGULATION SERVICES

International VAN services became possible following the implementation on September 1, 1987 of revisions to the Japanese Telecommunications Business Law. This has resulted in the following service selections being incorporated into NEC's International Network Service.

Data Communications Services

Data communications services such as QUIK-COMM, an international electronic mail service developed by GE, used to have to be provided via Kokusai Denshin Denwa Co., Ltd. (KDD)'s VENUS-P, an international public data transmission service. But with the deregulation of data communications services, NEC is now able to offer this type of service via its own international circuits.

New Advanced Communications Services

The deregulation of international VAN services operations has also made possible the provision of value-added (enhanced) communications services such as protocol and format conversion services. As a result, NEC has added a new service item to its International Network Services menu, called "Enhanced International Packet Switching Service with Protocol Conversion Functions."

However, this deregulation process has not changed anything as far as basic communications services are concerned. For example, it is still forbidden to provide basic communications services such as voice and simple (non-value-added) packet switching services to overseas users via international leased lines. The liberalization of these kinds of services is a task that must be tackled in future.

Merits Of Deregulation For The User

All the services being provided to users via NEC's International Network Services can now be furnished via the NEC-NET - international leased lines - MARK*NET network. The merits of this for the user as as follows:

1) From now on, users of the company's QUIK-COMM international electronic mail service will only have to enter into one contract, that with NEC, to avail themselves of these services. They will no longer be troubled by the need to enter into a contract for KDD's VENUS-P services as well.
2) Also, charges for the VENUS-P portion of this service will be incorporated into NEC's service charge system, enabling the company to set and manage all charges. It has also become possible for NEC to provide users with charge estimates.

3) NEC's advanced communication services now make it possible to support a variety of communications protocols, to include X.25, X.28, HDLC, BSC, ZENGIN and others. This in turn is greatly enhancing the accessability of user host-terminal systems to NEC's network. The biggest merit of this for the user is the fact that in-house computers and terminals can now have end-to-end access with the international network, enabling users to make use of the network itself for communications purposes.
4) Since NEC will be able to manage its International Network Services circuits on its own from now on, the company will be able to make the most of its network management system to enhance the quality of those circuits. This, of course, will prove another plus for the user.

INTERNATIONAL VAN SERVICES

This section describes a few of the ways in which international VAN services offered via NEC's C&C VAN International Network Services are being utilized.

QUIK-COMM: International Electronic Mail Service

One user of NEC's QUIK-COMM services is a large Japanese newspaper company with offices overseas. Figure 2 shows the network interconnections and types of terminal equipment being employed by this newspaper firm to avail itself of this service.

The user in question has offices located in 15 countries around the world. Journalists working at these various overseas offices use QUIK-COMM (on the MARK III system) to send their articles, written in Japanese, to the newspapers' Tokyo headquarters' network address, where they are registered. The headquarters constantly monitors the QUIK-COMM system for messages addressed to itself. When such messages arrive, the monitors pull them out of the QUIK-COMM system and route them into the newspapers own computer system (a local system based on NEC's PC98 LAN), where the information (articles) are transmitted to the filing and main processor systems. The special feature of the QUIK-COMM system for this newspaper company is the outstanding quality of the circuits used. When accessing the system from Japan via NEC's international leased lines, the user seldom if ever has to redial. The newspapers cost-performance for international data communications has improved 60% over what it used to be.

MARK*NET: International Packet Switching Service

A certain major Japanese travel agency uses NEC's international packet switching services provided via MARK*NET. The network interconnections and host-terminal equipment comprising this travel agency's system are shown in Figure 3.

The Japanese travel agency has host

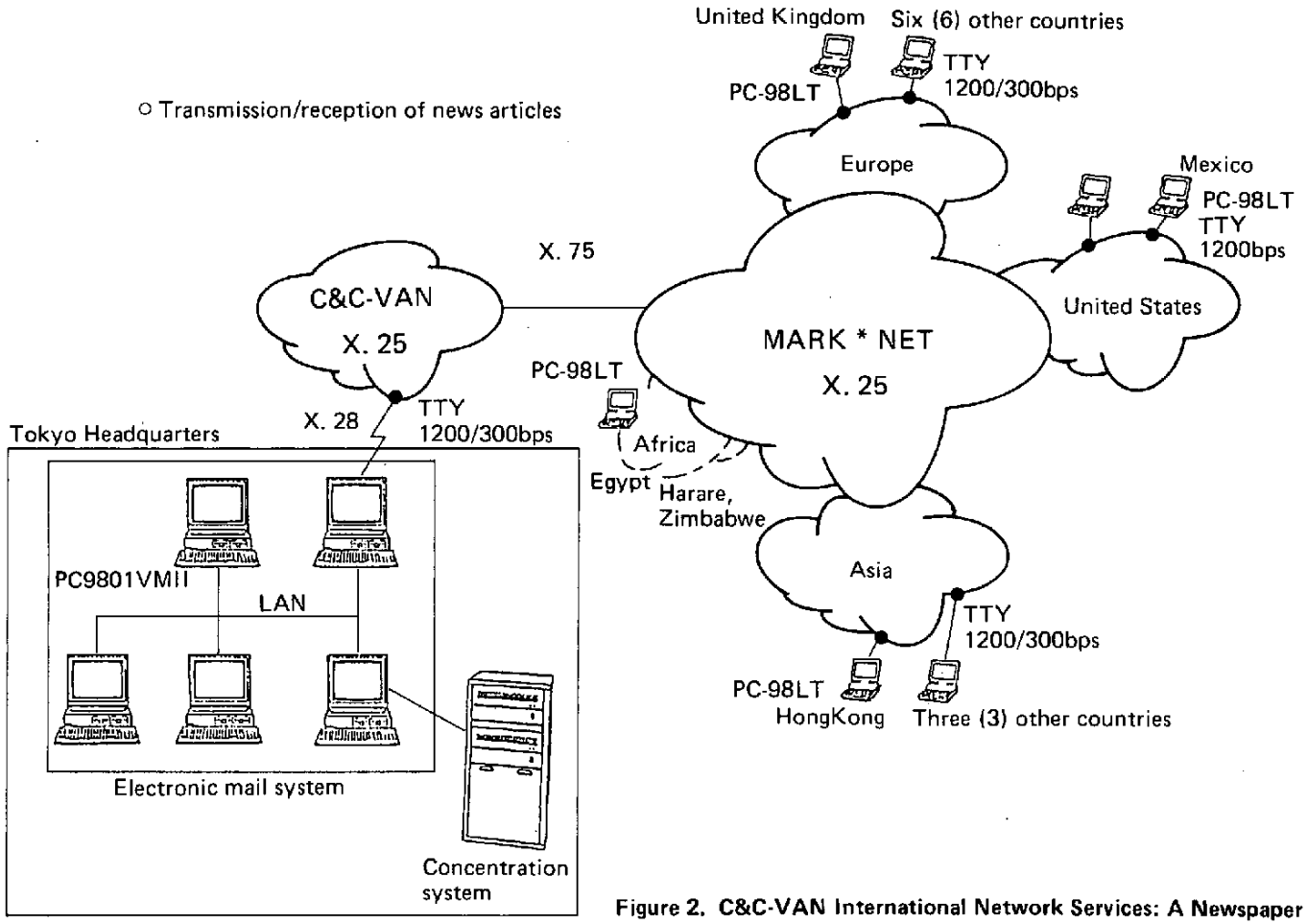


Figure 2. C&C-VAN International Network Services: A Newspaper Company

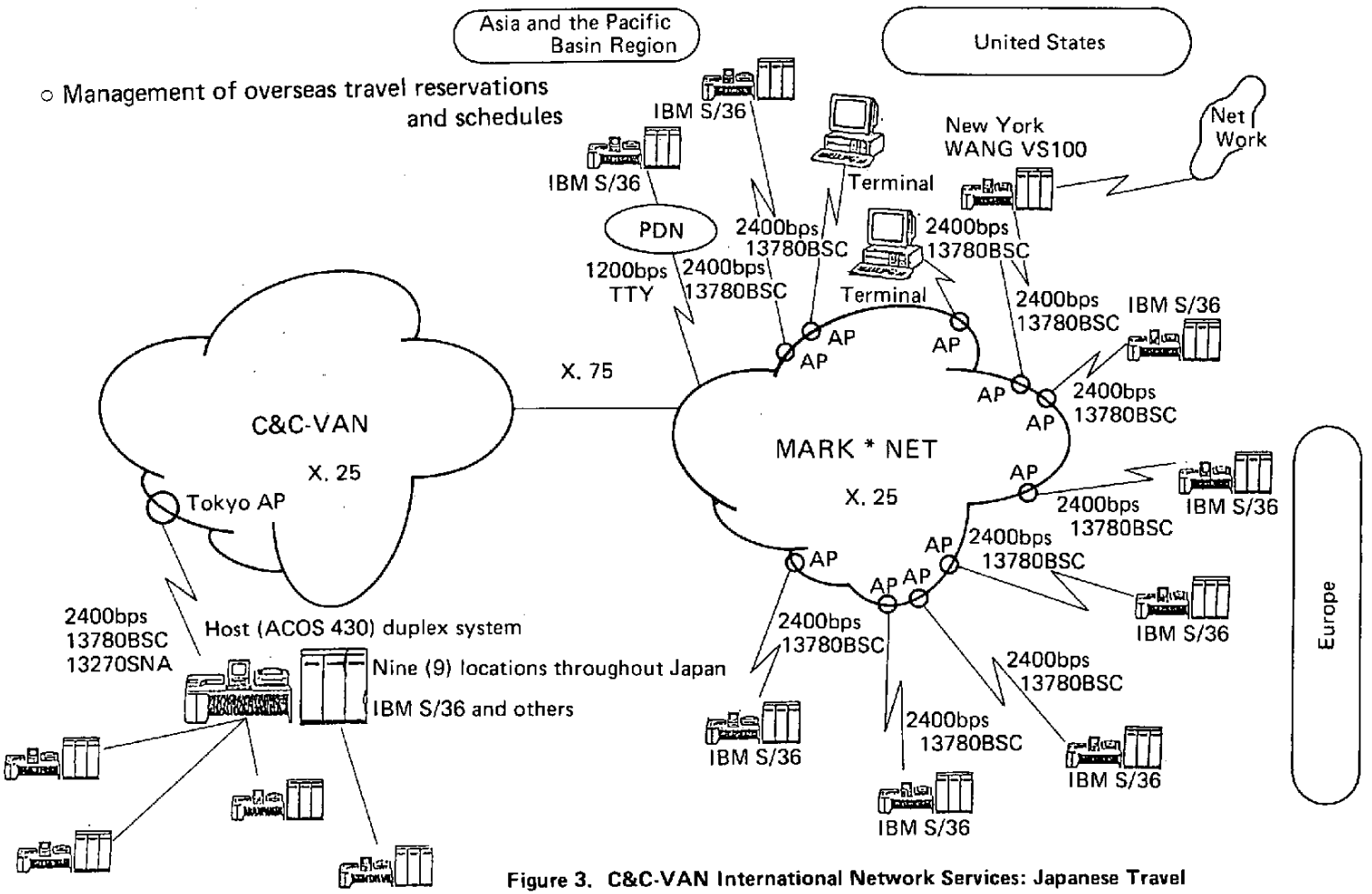


Figure 3. C&C-VAN International Network Services: Japanese Travel Agency With Host Systems in Japan and the United States

computers installed in Japan and the United States, which it employs to process travel plans, fare adjustment data and other types of travel-related work for between 20–30 sales agents in each country. By availing itself of the MARK*NET international packet switching services, the firm is now able to have its host computers transmit data collected from their respective low-end subsystems back and forth to each other serially in the batch mode as soon as this data has been concentrated. This is a high volume data transmission system that handles an average of 50MB of data per month (via both host systems), and is also equipped with a user application system that enables real-time processing as well.

The special features of these services for the travel agency include the flexibility of operation possible with the BSC communications protocol used in the system. Also, the data transmission efficiency of the C&C VAN International Network is extremely high, and network recovery measures are implemented the moment circuit malfunctions occur. NEC doesn't limit its support services to the network alone, but rather supports the travel agency in the development and construction of its host systems as well. The user is also looking forward to NEC expanding its VAN services into the United Kingdom and West Germany following government-level studies currently being carried out on the deregulation of VAN between Japan and the nations that make up the European community.

Another MARK*NET international packet switching services user is a major manufacturing firm with its headquarters in the United States. Figure 4 shows the host-network interconnections and terminal equipment being employed by this user to take advantage of these services.

This manufacturer is using MARK*-NET international packet switching services to enable its sales agents in Japan to access its host computer in the United States for the purpose of processing order placement and receipt transactions (transaction processing) and carrying out database inquiries (global marketing information).

This service is especially useful for the manufacturer because of the protocol conversion functions built into the MARK*-NET system. This protocol conversion function enables the user's agents in Japan to access its host computer using existing terminal or personal computer equipment. More specifically, the manufacturer's host computer in the United States uses only I3270SNA services with screen mode support functions, whereas its sales agents in Japan use terminal equipment that employ the X.28 (TTY) protocol. Without the protocol conversion capabilities built into MARK*NET, the sales agents' terminals would not be able to communicate with the manufacturer's host system.

FUTURE OUTLOOK FOR INTERNATIONAL VAN

As is evident from reading the preceding examples of how NEC's International Network Services are being used, the

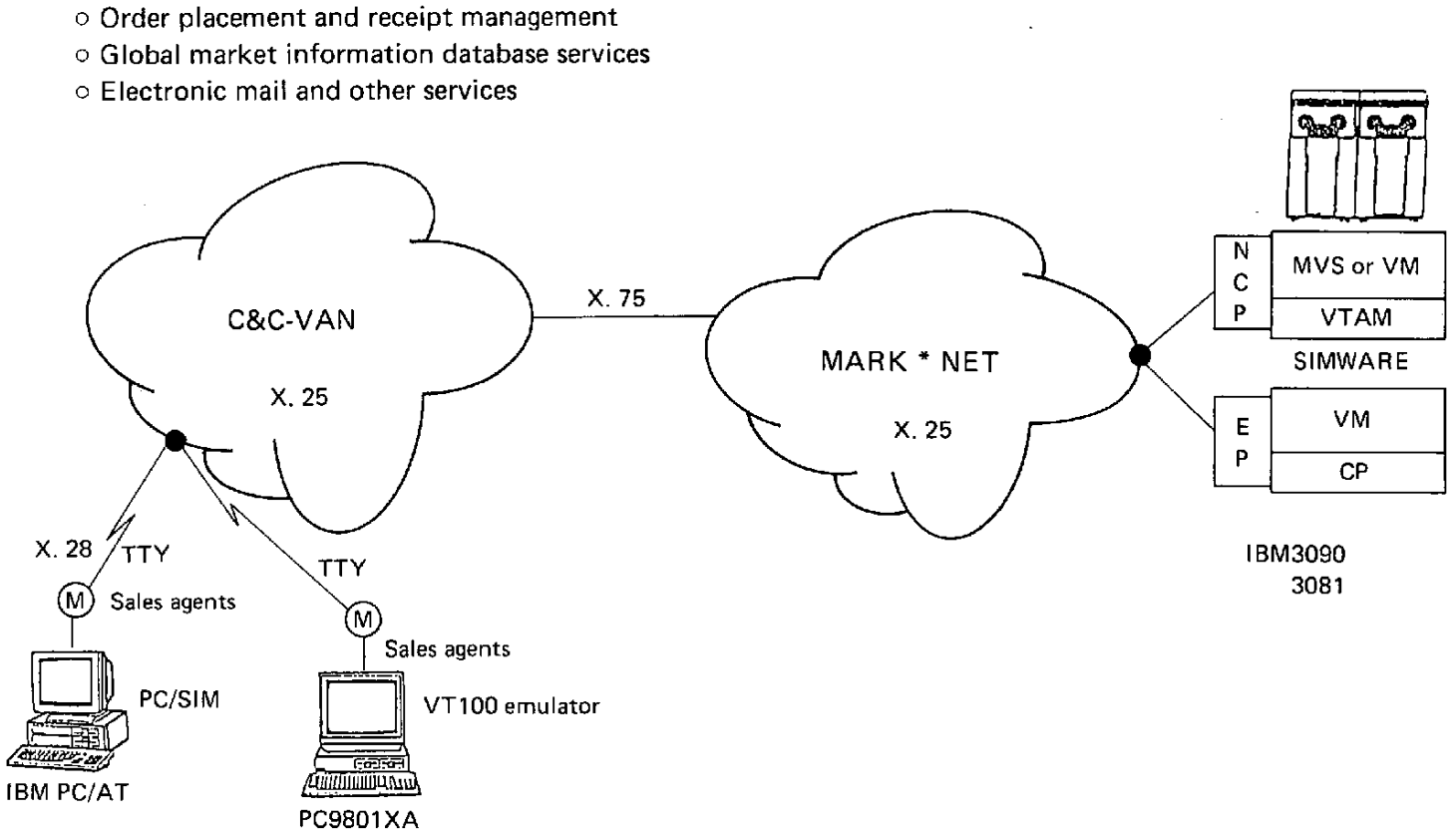


Figure 4. C&C-VAN International Network Services: Major Manufacturing Firm With Host System in the United States

biggest merit of these services is the users' ability to conduct everyday business and regular data exchange operations (both immediate and batch processing) on a worldwide scale as simply as if they had installed new terminals at their domestic locations.

Development Trends

At present, VAN services are only being utilized in Japan and the United States. For users of communications services from other areas around the world, such as Europe, Central and South America and the newly industrializing economies (NIES) of the world, the big question is how best to utilize processing services corresponding to VAN in order to make the most efficient use of limited VAN services. In other words, the important issue facing these users now is how to efficiently combine teleprocessing services with VAN services, thus integrating them.

Services By Groups Of Technical Experts

The provision of international VAN services to users around the globe raises numerous problems from the standpoint of support. In addition to technical support problems related to system development and operations, there are a number of organizational and personnel problems that must be solved, foremost among which are the establishment of global organizational structures and overseas assignments.

Consequently, it is extremely important from the standpoints of system construction, operation, maintenance and integrated management for users to select international VAN service vendors capable of providing total solution services via groups of technical experts located from one end of the network to the other.

At NEC we are putting to good use our long experience and accomplishments gained via the sale of C&C systems equipment (the introduction and construction of international network-dedicated facilities at users' locations) and our joint projects with GE to establish bases of operations in countries around the globe to eliminate these problems.

CURRENT NEWS

CARD-OPERATED TELEPHONE SECURITIES TRANSACTIONS

Leading Japanese securities houses have started working in earnest to commercialize new home trading systems that combine integrated circuit (IC) cards with specially-designed crystal display-equipped telephones. Nomura Securities Co., Ltd. has commenced testing 100 such IC card telephones developed jointly by Nippon Telegraph and Telephone Corporation (NTT) and Nomura Research Institute. These test phones are installed in homes in the Tokyo-Yokohama area. Daiwa Securities Co., Ltd. also has plans to test IC card phones installed in several hundred house-holds starting in October of this year. These special telephones are part of Daiwa Securities' new telephone service system which it developed jointly with VISA Corporation, Toshiba Corporation and NTT, among others. Daiwa Securities intends to commercialize these phones upon completion of testing in 1991, thus making telephone-based home trading even more convenient.

DO-IT-YOURSELF ELECTRONIC FUNDS TRANSFERS ON THE RISE

The use of in-house terminals to transfer funds electronically to banking houses via online systems connecting those terminals with the bank's computers is rapidly gaining popularity in Japan. At the end of 1987, the number of companies that had entered into contracts to utilize online banking systems to transfer funds electronically had risen to 52,000, up roughly 60% over the previous year's figure. This increase can be attributed to the rising number of small- and medium-sized firms using this service to rationalize their accounting processes, plus a strong sales campaign by Japanese banks looking to increase their revenues from commissions received from online funds transfer operations.

The Japanese Ministry of Finance relaxed its regulations on personal computer (PC)-based funds transfer operations at the end of April of this year, lifting a long-standing ban on inter-bank transfers (Prior to these revisions, banks could only carry out funds transfers with their own branch offices, but not with those of other banks.). The lower costs of purchasing

online terminals has also added to this trend. It used to cost upwards of one million yen to install a PC terminal for electronic funds transfer use. This was a substantial investment burden for most small- and medium-sized firms. However, in November 1987, Sumitomo Bank introduced a dedicated terminal that could be installed for just 360,000 yen. Then, starting in May, 1988, the Daiichi Kangyo and Fuji Banks began offering online funds transfer services via terminals that could be installed for as little as 300,000 yen.

Thanks to the relaxation of legislative restrictions and the decreasing costs of online terminals, it looks like in-house electronic funds transfer operations are going to become a key service in the field of firm banking.

AI-BASED AUTOMATED FLIGHT SCHEDULE PREPARATION SYSTEM

Fujitsu Limited teamed up with the All Japan Air Transportation Co., Ltd. to develop a computer system that utilizes a world first in artificial intelligence (AI) procedures to make possible the automatic preparation of flight and crew schedules. This system was put into operation on June 1, 1988. Making up flight and crew schedules is a very complicated task, which used to take more than 10 days to do by hand. But the new AI-based system makes it possible to cut this preparation time down to between just 5–7 hours. The AI procedures incorporated into this system make schedule simulation possible, something that has not been possible prior to this. The automatic schedule preparation system puts together schedules that make optimal use of available aircraft to service those routes that are the most popular, and therefore the busiest. This new AI system is also expected to help cut back on personnel and fuel expenses. Up until now, the world's leading airlines companies have all had to rely on long, arduous manual processes to put their flight schedules together. As a result, a large number of airlines are most interested in seeing how the new AI system performs.

MITI COMMENCES DEVELOPMENT OF A NEURO-COMPUTER

The Ministry of International Trade and Industry (MITI) has joined with private firms to develop a computer with ultra-distributed, ultra-parallel processing capabilities that mimics the data processing functions of the human brain. MITI has labelled this new system a "neuro-computer." The neuro-computer will be a revolutionary machine that utilizes a network of anywhere from hundreds of thousands to millions of operational devices that will make advanced parallel processing possible. The neuro-computer will also differ from ordinary computers in the way it computes data. Instead of processing information in accordance with a given set of procedures and rules, the neuro-computer will be designed to deduce its own procedures for solving problems just like we humans do, thus enabling it to process and/or control even

ambiguous types of information.

Six (6) private companies are scheduled to take part in this development project at this time. These are Fujitsu Limited, Hitachi Ltd., Toshiba Corporation, Mitsubishi Electric Corporation, NEC Corporation and Oki Electric Corporation. A total of 30 billion yen is expected to be spent on the project, which is scheduled to start in 1989 and continue for the next eight years.

NTT DATA COMMUNICATIONS

As of July 1, 1988, Nippon Telegraph and Telephone Corporation (NTT)'s data communications division broke off from the company to become an independent firm called NTT Data Communications Co., Ltd. This new firm is expected to become Japan's largest software development house, with a staff of some 6,800 personnel, overall assets worth 290.0 billion yen and sales for the first year anticipated at reaching 216.0 billion yen. The new company is a wholly-owned subsidiary of NTT, but if all goes as expected, by 1992 it should be listed on the stock exchange and NTT's share of the firm should decline. Also, employees will not simply be loaned out from the parent company to the subsidiary to be called back at some future date, but rather will be permanently transferred to NTT Data Communications to allow the company to compete fairly with other firms, including NTT itself.

Whereas the old data communications division of NTT was limited pretty much to the field of data communications per se, the new independent firm aims to expand its activities to include accepting orders for entire in-house communications networks incorporating extension stations and in-house facsimile communications. The company's data communications activities will make use of a newly developed data management system.

JETRO COMMENCES TRADE-ORIENTED DATABASE SERVICE

The Japan External Trade Organization (JETRO) commenced offering in July 1988 a gratuitous database service that links overseas trading firms anxious to export goods to Japan with domestic firms interested in importing products from overseas. The new system, called "TOPS," is built around JETRO's in-house computer system and enables JETRO to input into its computers the names and product lists of foreign exporters, and the points of contact (poc) and product applications/specifications of Japanese firms interested in importing from overseas. JETRO then retrieves data pertaining to Japanese importers and provides it to overseas trading firms capable of meeting their requirements. JETRO can also put Japanese importers directly in touch with prospective overseas exporters. To date, JETRO has gathered together pertinent information on 600 foreign firms and 1,100 Japanese companies, and is currently inputting this data into the system.

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