CHAPTER II

II. Planning Assumptions

1. Situation Surrounding International Telecommunications

(1) Perspective of International Telecommunications

The computerization and internationalization of society have been further accelerated. A qualitative change is occurring in the needs of customers in Indonesia vis-a-vis international telecommunications as the stage of Indonesia's economic activities expands throughout the world and the volume of information sent and received rapidly increases. The demand for telephone, a traditional service, will steadily increase parallel with the progres of internationalization. Enterprises which process and analyze a large volume of information for international economic activities will depend more on new non-voice telecommunications represented by data and facsimile communications, called "telematique" at the 7th CCITT plenary meeting, in conjunction with the penetration of computers and office automation. Public data communication networks in various countries of the world have been drastically increased to meet the recent demand for data communications. The age for establishing networks has passed, and we have now entered the age of commercial utilization. As data communication networks are connected to a greater number of countries, the convenience to customers is further enhanced. Therefore, data networks of various countries have to be joined internationally, and installation of international data switching networks is now being actively undertaken after the completion of international standardization of technologies needed for mutual connection.

In the United States, GTE-TELENET and TYMNET have expanded networks internationally through international recorded carriers (IRCs) of the United States and have services with more than 30 foreign countries. In Canada, TCTS (Trans Canada Telephone System) has built DATAPAC, connected to the two large American networks and to IPSS of the U.K. via Teleglobe Canada.

In Europe, public data networks have been built as domestic networks by a packet switching system centered on the U.K., France, and Spain, and by a circuit switching system centered on West Germany and Northern Europe. EURONET, a packet switching network built jointly by the nine EC countries, started commercial operation in February 1980.

International connection of public data networks such as IPSS of the U.K., TRANSPAC of France, and DATEX-P of West Germany is being undertaken.

Submarine coaxial cable and satellite communications are utilized for international transmission. These are analog transmission lines, and data circuits are multiplexed at present mixed with telephone circuits.

The bulk of the signals handled is voice in the satellite communication system used in INTELSAT, and the FM/FDMA system is dominant. The SCPC system is suitable for small-capacity communications and digital data transmission. To enhance the effective utilization of satellite repeaters, INTELSAT plans to gradually introduce the 120 Mbps TDMA system beginning around 1984, and this will permit easy realization of high-speed data transmission lines greater than SCPC lines.

Submarine coaxial cables are of an analog FDM system. Because signals are sent analog, these cables are not efficient for digital data transmission and are not economical. Research and development of optical-fiber submarine cable systems has been undertaken in various countries of the world at present. Intermediate distance systems for approximately 2000 km and long haul systems for approximately 10,000 km are estimated to be placed in commercial use in the mid-1980s and in the 1990s, respectively.

A maximum transmission capacity of about 1 Gbps per cable will be possible when optical-fiber submarine cables are in commercial use.

CCITT is standardizing a signaling system for connection to public data networks in various countries,

and both circuit and packet switching systems have been recommended. The number of packet switching systems is dominant in international connection compared with circuit switching systems reflecting a large number of domestic public data networks using the packet switching system. Global digital transmission lines are indispensable as international data communication networks. From the standpoint of worldwide public communication networks, its development as ISDN is promising, and ISDN is being actively studied in various countries of the world.

However, it will be a long time before ISDN is used extensively as international networks, and images of ISDN among carriers of various countries are not clearly defined yet. Typical images are:

Image 1

The basic mode for the future ISDN in the 21st Century will be for a telephone network (a digital circuit switching network using a basic unit of 64 kbps switching) to perform transparent bit transmission (end-to-end connection) in which all application traffic including telephone and non-telephone services flows.

Customers will be able to utilize network transparency or sophisticated functions such as communication storage and process services prepared by the network using intelligent terminals.

Image 2

Analyzing non-telephone traffic characteristics such as data and pictures, traffic can be divided into that which requires continuity and real time, and that which is in burst form. Some traffic has an extremely large quantity of information, while other traffic has only a small quantity. Packet networks are expected to continue to play an important role in future communication networks together with circuit switching networks when one foresees the expansion of communications between local area networks and other factors.

ISDN is aimed at integrated services in the subscriber system and has optimal and independent networks for each traffic of the same type divided by traffic characteristics (broken down by services) on toll and international network levels.

Thus viewed, the concept of ISDN is not fully clarified yet. However, there is no question that international data communication networks cognizant of network integration will continue to develop for the moment. High-speed and digitized transmission lines will be promoted, and assured availability of the transparency of information and control data, interchangeability and high reliability of terminals and services, accommodation of large-volume traffic, and other items will be required as network functions. A wide variety of additional services, international connection of different systems, etc. will become technical conditions for network development, and the store-and-forward system centered on packet switching will grow.

(2) Competition in International Communications

In international communications, telephone and telegraph services and leased circuit services have long been monopolized by carriers. In the area of international communications, there is today a rate competition in leased circuit services among international carriers and resale of leased circuits, the lessees of which build their own networks and capture traffic from communications networks of carriers. They are so-called value added networks (VANs).

In the competition among international carriers, Hong Kong and Singapore are playing the roles of switching centers in the southeast Asian region. However, when one considers Indonesia's geographical location, it is positioned as a gateway to the Middle East, Europe, and Australia for ASEAN. Indonesia is planning a cable linking Medan with Sri Lanka, the Middle East, and France and

another linking Australia, Indonesia, and Singapore. These two cable systems indicate the possibility of Indonesia becoming a switching center linking Indonesia with ASEAN, Australia, the Middle East and Europe.

In the competition with customers of leased circuits, there are two modes for borrowers of leased circuits to build networks and capture traffic from carriers' communication networks. One mode is the emergence of VANs such as Tymnet and Telenet.

The other mode is user group networks such as SITA (Societe International de Telecommunications Aeronautiques) and SWIFT (Society for Worldwide Interbank Financial Telecommunications).

The emergence of these modes is threatening to international carriers. In some countries, the monopoly of circuits by carriers has been discontinued and usage of circuits have been liberalized.

Leased circuits are offered based on a fixed rate system, and small and medium enterprises that do not have enough traffic to economically justify the use of leased circuits are not given an opportunity to use them for data communications. For this reason, the demand for a data communication service using a public subscription system are increasing. If such demand by customers is left unheeded, criticism against the common carrier by the customers will inevitably mount.

Some form of order is needed for the communication utilization system when one considers the necessity of offering needed communications without interruption in answer to the demands of society as an international communication carrier in Indonesia as well as realizing that communications are an important element of national sovereignty. On the other hand, it is also true that limited utilization of communications should not hinder the sound development of the information industry.

2. Long-Term Perspective of Indonesia's International Communications

(1) Perspective of Telegraph and Telephone Services

Parallel with the internationalization of society, users of the international telephone service will further increase, and international telephone utilization to and from homes, other than for business use, will increase.

International telephone traffic in Indonesia grew 30 to 40% a year between 1980 and 1982. In 1981 in particular, a phenomenal increase of approximately 50% was registered. This can be attributed to expanded ISD service, installation of new exchanges, and expansion of domestic communications networks. The demand for international telephone will steadily grow, and the utilization rate of ISD is expected to reach approximately 70% around 1987 and to about 80% in 2000.

The demand for telegraph service has decreased after peaking in 1974. The decreasing trend will continue. However, telegraph service is a basic international service and should continue to be offered. Its business must be streamlined.

International telex traffic will continue to increase. However, telex traffic will move to teletex, which is expected to be introduced in the near future, and telex demand will level off, or gradually decrease.

(2) Perspective for New Non-Voice Communications

International telephone service will continue to grow steadily, while telex growth will gradually decrease. The proportion of overall company revenue held by telex activities will decrease.

The lowered growth of telex demand shows a diversification of customer needs in international data communications. The real development of P.T. Indosat depends on how large a traffic share it can capture in non-voice services under international competition.

Telecommunication carriers are moving towards ISDN although concept of ISDN itself is still vague. There is no question that international data communication networks cognizant of integration will be developed for the moment.

For this purpose, P.T. Indosat must build a public data communication network as soon as practical to assure an expansion of the data communication network to establish telematique services, namely, teletex, data facsimile, international database access service, international videotex, message handling systems (MHS) and other services.

The first stage towards ISDN is the expansion of networks. Telephone, telex, packet switching data, circuit switching data, and other transmission networks must be built for the early 1990s. Telematique services will be offered at that time utilizing these communication networks.

The second stage is digital integration. Of the two large transmission media, i.e., satellite communications and submarine cables, a 120-Mbps TDMA system will be introduced in satellite communications around 1984. In submarine cables, digital transmission lines using optical-fiber submarine cables will be introduced in the 1990s. Therefore, digitalization of international communication circuits will be carried out at that time.

The third stage is integration of services using data communication networks. The time frame will be from the middle to the end of the 1990s. The network configuration will have either a circuit network or a packet switching network, or a combination of the two.

This is where opinions are divided among individual countries and people. The circuit switching data network is suitable in terms of its simplicity and economy. However, the packet switching network system has its own advantages. For example, processing of multiple traffic and high network flexibility will be facilitated in conjunction with information standardization, and traffic processing efficiency will be increased using packet multiplexing and delay system switching processing. It also has a transmission control capability including error

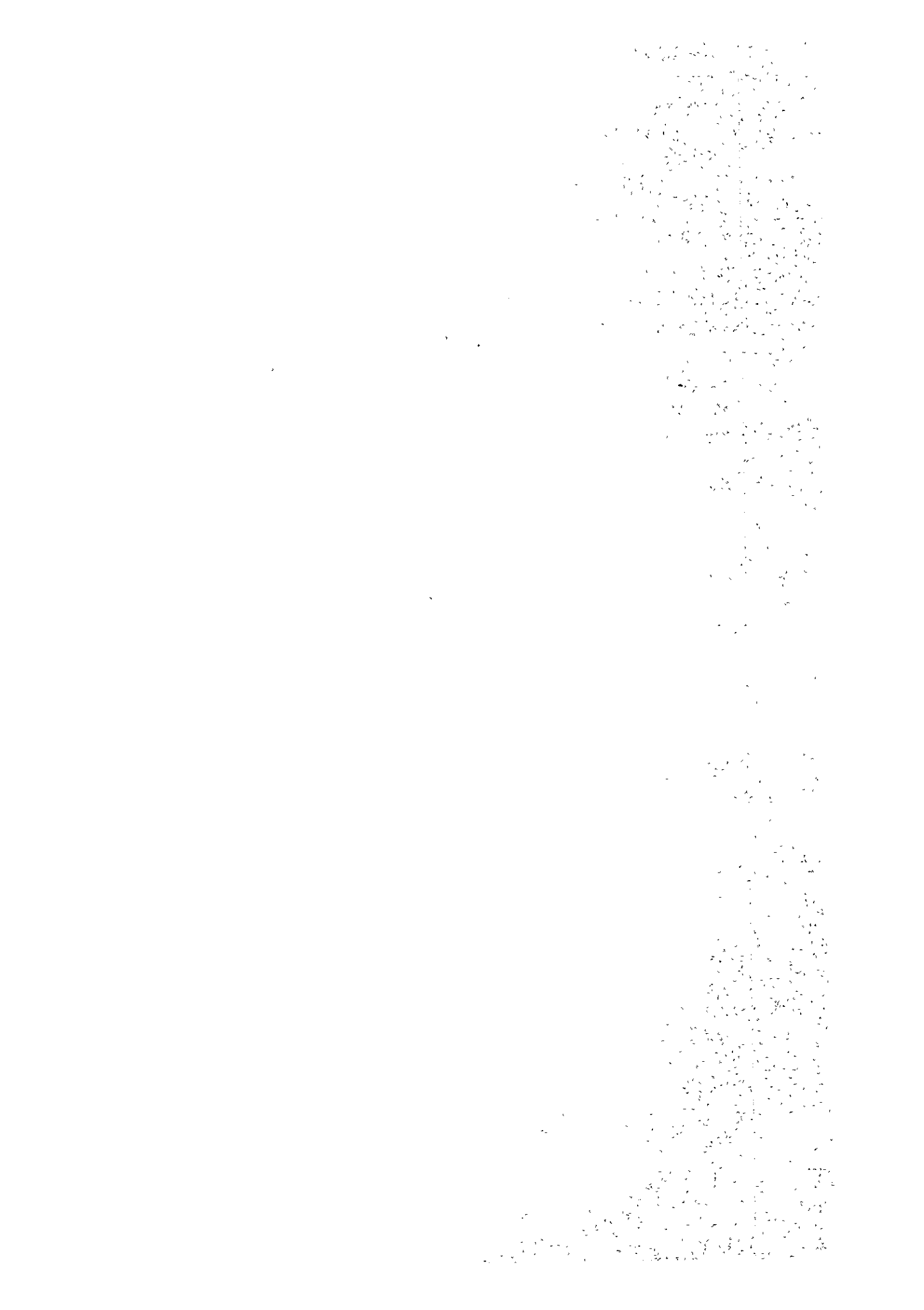
controls in multiple message communications and connection between terminals of different types utilizing information storage.

It is too early to conclude which network configuration will win until the global trends are analyzed and observed.

The fourth stage is digital integration of services. This stage will be realized towards the end of the 1990s. ISDN will be partially introduced in domestic networks in some countries by the end of the 1990s. The time for introduction differs from one country to another in international communications, and individual service networks and ISDN will mix. Future research by CCITT is awaited regarding inter-network connections.

CHAPTER III

1.



III. Master Plan

1. Development of Services

1.1 Basic Concept of the Services

The services will be developed on the following basic principle.

(1) The demand for international telecommunications will increase in volume and it will be necessary to upgrade and diversify services along with the progress made in technological fields and socio-economic advancements. To match these trends, existing services will be expanded and new services will be introduced.

(2) Existing services and new services should be extended while maintaining a good level of service, reasonable charges, equal opportunity and stable operations.

(3) International telecommunications by the nature of its business requires cooperation with foreign carriers. It must be conducted under close coordination with overseas carrier organizations. Accordingly, better coordination and cooperative relationships must be considered when processing with the development and extension of services.

In addition, P.T. Indosat will take a positive role in the activities of international organizations, e.g. ITU, INTELSAT, etc. and other local authorities, thereby contributing to the global progress of international telecommunications services.

(4) For international telecommunications services to expand, it is indispensable that the domestic communications network is arranged in advance. For this purpose, a close relationship with PERUMTEL shall be promoted, because the sole operating agency of domestic telecommunications is required to maintain an interface between international telecommunications and domestic telecommunications, system installation, possession and operation.

Therefore, every effort should be made to offer and develop smooth and convenient international telecommunications services.

(5) At present, international relations are becoming closer and this results in an increase in international telecommunications demands. In addition, international telecommunications traffic is apt to shift toward countries prepared to submit good, low-cost services. In consideration of this, new demands for international telecommunications will be fulfilled by introducing new services at an early date while making full use of functional methods of management in the manenr of a common stock company.
On one side, a harmonious relationship shall be pursued with the domestic telecommunications network and, on the other, new international services will be actively introduced whenever needed, without waiting for the beginning of domestic services.

1.2 Extension of Existing Services

1.2.1 International Telephone

International telephone services will become more important in the future. (Note)

These services shall be actively promoted by the following method:

(1) Promotion of International Subscribers' Dialing (ISD)

① ISD is very effective in drastically improving telephone services and making operations more efficient. Therefore, continual efforts will be made to increase the number of overseas destination countries. In addition, with the cooperation of PERUMTEL, the domestic area available for ISD will be positively supported.

② To encourage the user of ISD, aggressive publicity will be used in such formats as customer meetings and through mass media, such as newspapers, magazines, radio, and

TV. Also, a study will be made on the abolishment of the deposit requirement of ISD and a revision of its tariff.

(Note) "Data phone" type service, which is facsimile transmissions through telephone network, was begun in Indonesia in January 1982. However, judging from the trends in foreign countries for similar services, the demand for facsimile transmission is expected to grow very rapidly. It will occupy an important part of ISD traffic.

(2) ISD services from public telephones, i.e. coin telephone will be introduced in the early stages. International public telephone sets will be installed in international airports, hotels, and other main places.

(3) Automobile telephone ISD services will also be introduced.

1.2.2 International Telex

International telex will steadily increase in traffic for some time in the future, as one of the most important telecommunications means together with international telephone. However, when new services such as facsimile transmission through telephone network, public data communications services and teletex become popular in the future and replace telex, its traffic will gradually shift toward these new services. Of these, teletex is expected to directly replace telex. However, it will take about 10 years before teletex deeply penetrates the market.

As described above, the important features of telex communications have been comprehensively taken into account to plan the improvement of services and stimulate demand.

Store Program Control (SPC) exchange will be installed in Medan, Jakarta to offer store and foreward service, multi-address service, announce service, camp-on service, abbreviated dialing, and other additional services.

1.2.3 International Telegram

International telegram was the major means of international telecommunications in the past. However, the number of service demands is now gradually decreasing due to such factors as the penetration of telex and the improvement of telephone services. When new services are introduced in the future, e.g. Bureaufax, these trends will become more significant.

Because of this trend of international telegram utilization, it will soon become financially deficit. Therefore, efforts will be made to simplify services and reduce operation costs.

1.3 Extension of New Services

1.3.1 Bureaufax Services

(Bureaufax services were introduced in 1982.)

In these services, messages are received by a clerk at the international telegraph office. Then, the messages are internationally transmitted by means of facsimile to the receiving stations which distribute them to the intended persons.

When facsimile services become sufficiently popular in the future home market, messages sent from customers' facsimiles would also be readily accepted, in addition to acceptance by a clerk at a service counter.

1.3.2 International Audio-Graphic Conference

In 1982, international audio-graphic conference was

introduced. This service enables to have a conference with voice, characters and graphs by means of conference telephone terminals comprising microphones and speakers and slow-scan TV.

When the business activities of companies become more internationalized, people will have to travel more often, resulting in larger expenditures of time and money. Teleconference will be effective to cut this travel time and expense and make business activities smoother. Therefore, every country has attention focused on it with expections for its future development in the market.

For the time being, a test service will be begun to Singapore for one year to determine demand trends. The results will serve as a reference to decide how soon commercial introduction should be made.

1.3.3 Data Communications Services

By virtue of the recent development and progress of computer technologies and communications techniques, data communications have been increasingly in demand to internationally transmit various kinds of data and information by a combination of computers and telecommunications lines

At present, these data communications are available through leased lines. However, leased lines are offered at fixed charges. Consequently, for users who do not have sufficient traffic volume to compensate for the fixed charges, data communications are not practical.

As a result, there is a demand for a public subscriber type data communications system which can be used by anyone.

If these user requirements are left intact, telecommunications monopolies might be criticized. On the other hand, this may stimulate "VAN jobbers" which lease lines from the carrier and offer the services with extras. Telecommunications carriers in each country have introduced or are introducing various kinds of high-grade data communications services using the new public data communications network to cope with these demands.

P.T. Indosat will recognize the important feature of

data communications for industrial and economic activities of the nation and for the recent international trends mentioned above. On this point, demands for data communications will be comprehensively dealt with international public packet switching service as follows:

Looking at international trends of data communications services, low-speed data transmission services are introduced to make access to foreign database computers, e.g. ICAS of KDD, and also high-speed data transmission services are introduced between computers, computers and terminals, and terminals in each country.

When constructing a public data network to offer these types of high-speed data transmission services, there are two kinds of network construction; in one, both packet switching network and line exchange network are erected and, in the other, either of these is installed, depending on the characteristics of each country. However, as far as the international data communications network is concerned, most countries have constructed the packet switching network. (See TABLE 1.3.3.1 and Fig. 5.1.4.2.)

Considering such international trends, P.T. Indosat will construct the packet switching network as international public data network of Indonesia and introduce various kinds of the following services in stages.

(a) Phase I

In 1985, international database access service and international realtime data transmission service will be introduced with the packet switching facility.

i) International Database Access Service (IDAS)

IDAS offers database access from Indonesian terminals to various overseas countries to enable information retrieval. Through IDAS, foreign database computers become accessible to acquire the most up-to-date industrial, economic, social, chemical, medical, pharmaceutical, managerial and other information.

In addition, data can be processed. It is very important for the growth of industrial and economic activities, e.g. reinforcement of international competitive power for industries, that the newest information can be accessed and utilized throughout the world.

An Outline for the services is as follows:

① Baud rate 110 - 1200 bps

② Handling destination

The US will be the connecting country for the time being, where databases connected to Telenet and Tymnet networks are made accessible. Later on, services will be extended to make these accessible to European databases via the US.

③ Method of access

a. Access via subscriber line
(Temporarily, Urban Jakarta)
b. Access via subscriber telephone
(service and area will be nationwide)

④ Charge

Volume sensitive tariff system will be applicable, consisting of an hour/minute rate and transmission charge.

ii) International Realtime Data Transmission Services

According to these services, data transmission, message transmission and facsimile transmission will be enabled in realtime between computers, computers and data terminals, and data terminals.

An Outline of the services is planned as follows:

① Baud rate

2400 - 9600 bps (referring to the future demand trend, the introduction of 48 kbps will be studied)

② Destinations

Starting from Japan, US, Singapore, Hong Kong, etc. Then, services will be extended in stages.

③ Terminal interface

Basic interface will conform to CCITT Recommendation X25. However, protocol based on BSC will also be applicable.

④ Method of subscription

a. Utilization by means of dedicated lines (subscription of P.T. Indosat)
b. Utilization via PERUMTEL's domestic packet network by connecting the international packet network and domestic packet network (subscription of PERUMTEL)[Note].

Note: If PERUMTEL's domestic packet network is not constructed, only utilization of dedicated lines (subscription of P.T. Indosat) will be available for some time. Also, if PERUMTEL's domestic packet network is begun earlier than the international packet network, P.T. Indosat has to choose either of the following two methods; in one, P.T. Indosat takes its own subscribers via dedicated lines and, in the other, all subscribers of PERUMTEL are employed, as in the present telex subscription. The choice shall be determined in consideation of the relationship to PERUMTEL, problems of system maintenance and operation, economy, and other factors.

⑤ Charges

Volume sensitive tariff system consisting of hour/minute rate and transmission charges.

⑥ Additional functions

Additional functions shall be introduced, e.g. packet multiplex function, abbreviated dialing, direct calls, etc.

(b) Phase II

International message store and forward service and international teletex service will be introduced in 1986.

i) International Message Store and Forward Services

The function of MHS (Message Handling Systems) is now under study for standardization by CCITT. This will be added to the packet switching network.

In these services, various functions will be offered, e.g., closed area connection, mail box, priority order, stored message retrieval, multi-address communications, distributing condition notice, code change, etc.

In addition, by virtue of these services, computer conference services will also be made available.

In computer conference services, conferences can be made by means of teletype, CRT terminals, word processors with communications function, etc. through the computer. All information is transmitted and received through a computer. In computer conference, the mail box function of these services is used. Therefore, the features of the services include the fact that attendees of a conference are no longer needed to assemble at the same time.

System configuration and charges for these services will be determined referring to the progress of the study in CCITT, trends of each country, user requirements, amd other factors.

Further, in a considerable number of countries, leased line exchange services are available (message store and forward services using leased lines.)

By observing user preference for leased lines in the future, whether or not this kind of leased line exchange service will be introduced will be studied. For the time being, however, needs for the leased line message store and forward services will be effectively supplied by the above-mentioned services.

ii) International Teletex

Teletex was commercially begun in West Germany in March, 1982. Also in the UK, Netherlands, Spain, and other European countries, home services will start during 1982 and 1983. (See TABLE 1.3.3.2.)

CCITT has proceeded with the standardication of the teletex. In November 1980, basic subjects were tentatively recommended. These include teletex jobs (Recommendation F200), teletex terminals (Recommendation S60), control procedures of teletex jobs (Recommendation S62) and character repertory and codes (Recommendation S61).(Note) Study is still continuing to issue or prepare recommendations in such areas as the charge system for teletex, various problems of operations and charges of communications between telex and teletex, interface between telex and different types of networks and mixed mode operation of facsimile and teletex.

In consideration of these subjects of study in CCITT and the trends of domestic service implementation in each country, it is assumed that international teletex services will be introduced in Indonesia in 1986.

According to the CCITT Recommendation, teletex shall use either the packet switching network, circuit switching network or the telephone network. For the time being in Indonesia, the utilization of a high-quality packet switching network will be planned.

In addition, with respect to PERUMTEL's relationship with the domestic teletex, there has been discussion on when to start P.T. Indosat's teletex services and whether or not P.T. Indosat shall have its own subscribers, as in the introduction of real-time data transmission services. However, the conclusions will be the same as previously mentioned.

Note: The major features of teletex may include the following in reference to the subjects recommended.

° Communications are performed by automatic exchange between subscriber terminals with memory devices using the public communications network.

° The applicable network shall consist of a circuit switching network, packet switching network or telephone network. It will be freely determined by the government in each country (telecommunications carrier).

° Communications function fitted typewriters are intorduced as a kind of basic teletex terminal.

° The baud rate of teletex between countries shall be up to 2,400 bps.

° By interface with telex networks, communications between telex terminals and teletex terminals are enabled.

° Received messages can be displayed by printing or other means, according to the characteristics of a terminal. In printing, the format and layout of the message shall comply with the manuscript transmitted.

° Even during the generating time of a sentence message upon setting the terminal to local mode, the arriving message can be received.

° The applicable communicating paper shall be ISO

(International Standardization Organization) A4 size (210 x 280mm) and North American size (216 x 280mm), in either a horizontal or vertical format.

When comparing teletex and telex, features of the teletex include terminals comprising word processors which can edit and store information, a baud rate about 50 times higher than telex, separation of communications functions and sentence editing functions of terminals, simultaneous use for both of these functions, capability to transmit both figures and hand-written documents, etc. in addition to letters by the adoption of a mixed mode, and so forth.

(c) Phase III

Data Facsimile (Datafax)

Datafax is the facsimile service provided through public data network which enables to keep high quality, high speed transmission and various additional functions. CCITT has been studying the standardization of Datafax service and G-IV type terminal equipment.

The time for introduction of Datafax service should be considered by observing progress of the study in CCITT and the trends of service introduction and demand in the world.

1.3.4 Marine Satellite Communications Services (Note)

(1) Regarding marine satellite communications services, the US Marisat was begun in February, 1976, open to ships of each country. On the other hand, the International Marine Satellite Organization (INMARSAT) was established in September, 1976 to prepare marine satellite communications services. In February, 1982, these INMARSAT services were commenced, thereby taking over the services of Marisat.

Marine radio communications using shortwaves have a restriction on the communicating time and coverage due to the propagating characteristics of shortwaves. In addition, there are other problems such as insufficient communication quality and channel capacity. On the contrary, in marine satellite communications services, high-quality services are offered. These include telephone, telex, data communications, etc. which are operated as 24-hour services covering the whole world. As described above, marine satellite communications can drastically improve international marine telecommunications on the basis of shortwave radio. Its introduction will be very effective to assure the safety of ship navigation and its efficient controls of cruising, etc.

Marine satellite services have already been introduced in many countries and demand is continually growing.

Indonesia is a country consisting of many islands. Consequently, marine communications occupy a very important sector. These services should be promptly improved. In view of the above features of marine communications including the importance of its role, extendability and conditions of introduction in foreign countries, etc., marine satellite services will be introduced through the following concept:

① Facilities will be installed in ships registered in Indonesia and marine satellite services will then be introduced.

② The following kinds of service will be rendered.

a. Telephone (two-way)
b. Telex
c. Data communications (data transmission using telephone lines)
d. Facsimile communications (facsimile transmission on telephone lines)
e. Distress call (non-delay service by priority code)
f. Emergency communications (connected with priority)

In addition, as soon as marine satellite services are developed, leased line services, broadcasting services, high-speed data transmission services, marine computer access services, etc. will be introduced.

(2) Facilities for marine satellite services will be introduced in stages as follows, taking their effective utilization and economy into account.

1st stage: For the time being, no coast earth station will be prepared but the services will be offered via foreign coast earth stations. Therefore, demand trends will be determined and and promoted.

2nd stage: For satellites in either the Indian or Pacific Ocean, a coast earth station will be constructed facing the ocean with the larger traffic. (For coast earth stations facing other oceans, foreign coast earth stations will be used. As an example in this case, TRU will be set with foreign carriers permitting mutual utilization of coast earth stations and their charges will be canceled.)

3rd stage: When demands for marine satellite services are realized and it is considered feasible to have two coast earth stations, an earth station will be erected facing an ocean other than that of the existing coast earth station.

(Note) In Indonesia, marine communications are currently handled by the Bureau of Marine Transportation. However, it is assumed that marine satellite communications services will be borne by P.T. Indosat.

1.3.5 International Video Conference

Video conference deals with the services of audio graphic conference and dynamic picture transmission of full motion.

An experimental video conference is planned by CEPT (European Post and Telecommunications Conference), among European countries. In addition, a demonstration will be held in the spring of 1984 by INTELSAT to exhibit the effectiveness of international video conference. Moreover, in various countries, experimental domestic services are conducted at present. Thus, practical services are being prepared (see TABLE 1.3.3.3).

In CCITT, SG-XV is continuing study on the teleconference room and transmission route.

On the basis of these international trends, the services will be introduced in the following stages.

(1) The services will start in 1985.

(2) A studio type of service is planned where a teleconference room is located in the building of P.T. Indosat, as the first stage. Then, depending on customer requirements, facilities will be installed in the customers' premises, by means of portable equipment.

(3) From 1990, color video conference will be adopted as long as the video conference services continue to develop technologically.

1.3.6 International Videotex

(At present, the application of international videotex services is planned for 1989.)

The basic concept of videotex is a service in which an adaptor is attached to the house TV set for a terminal and then, via the public telecommunications network (telephone

network, data network), an access can be made to a database to receive necessary information on the TV set. By means of videotex services with other added functions, various kinds of services can be offered to users. Among these are message communications between terminals, tele-shopping, home banking and other transactions and services to users in limited areas.

The introduction of videotex is now being planned in many countries. The UK played a leading role in this field, where videotex has been in commercial use since June 1979. By around 1985, commercial domestic services would be commenced in a considerable number of countries. (See TABLE 1.3.3.4.)

In CCITT, the fundamental subjects for videotex have already been recommended. (F300)

In the UK, commercial international services were begun with 7 countries in July, 1981. However, in other countries, the introduction of international services will begin eventually after the completion of domestic services in each home market.

Referring to these trends in each country, international services in Indonesia will be introduced on the assumption that domestic services will be completely established there in 1989.

In international videotex services, foreign videotex and Indonesian videotex are interconnected. Thus, an Indonesian subscriber can make access not only to the database at home but also to foreign databases. Demand for international videotex will mainly comprise business utilization.

1.3.7 International Electronic Mail Services

According to the concept of international electronic mail services, a message is received at a post office. Then, it is transmitted internationally by means of telecommunications and distributed to the receiver from the receiving post office. Electronic mail services are offered as a postal service

in many countries. In Indonesia, too, they are estimated to become available as postal services. In this case, P.T. Indosat will contract a job-commissioning agreement with the postal division, through which transmission services are handled internationally by P.T. Indosat for international electronic mail services.

1.3.8 Direct Satellite Communications Services

In direct satellite communications services, a subscriber installs an antenna on the roof of a building, through which he makes access to the satellite for telecommunications with other subscribers, in a direct roof-to-roof manner. These services are comprehensive digital dedicated network services enabling such utilization as voice telecommunications, high-speed data transmission, high-speed facsimile transmission and video conference.

Direct satellite communications services were begun on a commercial basis in the US in March, 1981, by the SBS company. Also in the UK, the services will begin in 1984, handling the whole of Europe. It is expected that direct satellite communications services will be put into commercial operation by many countries in the near future.

When these services become available internationally, the relationship with INTELSAT should be checked carefully. INTELSAT will study when and how to introduce the services, while watching the trends of future international demand.

1.3.9 Integrated Services Digital Network (ISDN)

CCITT is currently studying the technical problems of ISDN. Also, in a number of countries, research and development is being carried out toward the goal of commercialization in the 1990s to 2000.

With these circumstances, it is planned that, in Indonesia too, ISDN will be established in the latter half of the 1990s.

In ISDN, all kinds of information are transmitted through a network, then stored, exchanged or processed. In other words, it is an information network system with the following features:

a. It can universally and economically handle almost every kind of telecommunications including telephone, telegram, telex, facsimile, data telecommunications, picture telecommunications and mobile communications.

b. A user can freely connect a terminal and use a number of terminals at the same time.

c. Signals between terminals are totally digitalized.

d. The network has transparent transmission functions, storage, exchange and processing functions. Also available are communication between different kinds of machines or communication between different services (e.g. telex-facsimile, facsimile-data terminal, etc.)

e. It is connectable to various kinds of databases, offering necessary information to every user.

f. Leased line services and leased network services will become available at low cost.

g. Charges for every service are computed by the number of bits. Hence, although the past rate systems were diversified, the new system will become systematically arranged.

h. Telemetering and telecontrol services will also become commercially available.

When ISDN is realized with the foregoing high-grade network functions, society will be highly informationalized.

1.3.10 Other Services

The following services will appear toward the 21st century.

Regarding telephone, a super-mini cordless telephone set will be used. Also, international TV and telephone will

appear in practical applications.

The transmission rate of facsimile services will become higher. In addition, high resolution and color services will be put on the market aiming at transmitting newspapers, magazines and other media.

In regard to mobile telecommunications, aviation satellite telecommunications services will start in the near future to submit measurement information to maintain flight safety and for public transmission. In addition, mobile telecommunications equipment to be mounted on ships and airplanes will be developed in even smaller sizes and lower costs. Moreover, higher grade services will be offered.

In respect to terminals, composite terminals which can satisfy the various functions of telephone, facsimile, data and picture will be developed.

It is necessary to observe the various kinds of new services that are expected to appear in the future and take an interest in their technical developments, attitude of each country, demand trends, etc. Thus, whenever either one becomes necessary, it should be readily introduced.

These kinds of high-grade and multi-functional new services will be developed and penetrate the market. This will result in more efficient handling and processing of information reception and transmission and will reflect great economic progress as well as the improvement of human life.

TABLE 1.3.3.1 Major Public Data Communications Services

Nation	Service (or network)	Organization	Exchange	Baud Rate	Initiation Date	Domestic or International	Remarks
Japan	DDX	NTT	C	200bps-48Kbps	Dec. 1979	Domestic	
	DDX	NTT	P	200bps-48Kbps	Jul. 1980,	Domestic	
	ICAS	KDD	P	300bps-1,200bps	Sep. 1980	International	
	VENUS-P	KDD	P	2,400bps-9,600bps	Apr. 1982	International	Sep. 1982 Connected to DDX (packet network)
USA	Telenet	GTE-Telenet	P	50bps-56Kbps	Aug. 1975	Domestic	GTE/Telenet merged in June, 1979
	TYMNET	TYMNET	P	110bps-9,600bps	Apr. 1977	Domestic	
	Graphnet	Graphnet	P		Jan. 1975	Domestic	Facsimile service
	FAX-PAK (COM-PAK)	ITT.DTS	P		Dec. 1979	Domestic	Facsimile service
	DSDS	AT&T	C	56Kbps	Indefinite	Domestic	Approved in June, 1977 with FCC conditions.
	ACS	AT&T	P		Jun. 1982	Domestic	Will be offered through a subsidiary.
	BPSS	AT&T	P		1982	Domestic	Rate applied in March, 1982 by FCC.
	UDTS	ITT	P	110bps-9,600bps	Feb. 1977	International	
	DBS	WUI	P	110bps-9,600bps	Feb. 1977	International	
	LSDS	RCA	P	110bps-9,600bps	Aug. 1977	International	
UK	PSS	BT	P	110bps-48Kbps	Oct. 1980	Domestic	Commercial operation started from August, 1981.
	IPSS	BT	P	110bps-9,600bps	Dec. 1978	International	
	X-Stream	BT			Partially started in 1982-83.	Domestic International	Naming of comprehensive digital network planning
France	Caducée	PTT	C	2,400bps-9,600bps	Jan. 1972	Domestic	Up to 72Kbps available in urban areas.
	Transpac	Transpac	P	50bps-48Kbps	Dec. 1978	Domestic International	Transpac Co. was established by common shares of PTT and private firms.
West Germany	DATEX-L	DBP	C	50bps-9,600bps	1975	Domestic	
	DATEX-P	DBP	P	110bps-48Kbps	Aug. 1981	Domestic International	Test-operated since August,1980.
Canada	DATAPAC	TCTS	P	110bps-9,600bps	Jun. 1977	Domestic	
	Infoswitch	CNCP	P/C	110bps-9,600bps	Jul. 1978	Domestic	Hybrid exchange
	DATAPAC International Service	Teleglobe Canada	P	110bps-9,600bps	1977	International	
Spain	RETD	CTNE	P		1971	Domestic International	
Northern Europe	NPDN	PTT of Norway, Sweden, Finland and Denmark	C	Synchronous 600-9,600bps Asynchronous. Depending on each country.	1981	Domestic International	
Netherlands	DATANET 1	PTT	P	2,400bps-48Kbps	End of 1981. Not definite.		
EC countries	Euronet	EC Committee and PTT of each country	P	110bps-9,600bps	Mar. 1980	International	Test began in November, 1979.

P: Packet switching C: Line exchange

TABLE 1.3.3.2 Teletex Planning in Each Country

Nation	Initiation Date	Remarks
West Germany	Started on commercial basis in March, 1982	° Test began in March, 1981 ° DATEX-L used
UK	Beginning of 1982	° Both PSS network and telephone network used.
France	1983	° Domestic services done by Transpac or telephone network (under study) ° International services done by Transpac.
Spain	Middle of 1982	RETD used
USA	September, 1982	Domestically serviced by WUT.
Netherlands	1983	
Italy	1982	
Switzerland	End of 1981 (test started)	
Sweden Denmark Finland	1982 1983 1982	

TABLE 1.3.3.3 Video Conference in Each Country

Nation	Organization	Service	Initiation Date	Remarks
Japan	NTT	TV conference	1976 (test started)	°Fixed type TV conference service °Aiming at a monitor test between Tokyo (Imperial Hotel) and Osaka (NCB Royal Hotel). °The service terminated in January, 1982.
	NTT	(New type) TV conference	1982 (commercial test) 1983 (practical use)	°Intra-company mount type TV conference service where equipment can be mounted in a convenient place.
USA	AT&T	Picture phone meeting	1977 (test started) June, 1982 (practical use)	°Application to FCC for commercial service to start in the beginning of 1981. In April, 1982, approved.
	SBS	CNS (Communications Network Service)	1981 (starts on commercial basis)	°Tele-conference consisting of the transmission of voice, static picture, dynamic picture, storage and retrieval of images and documents.
	Comsat. General Intercontinental Hotel	Video converence	Oct.-Dec., 1982 (starts on commercial basis)	°Tentatively offering services between New York and London.
UK	BT	Confravision	1981 (starts on commercial basis) 1971	°Fixed type TV conference service °Among 5 cities at home °Color TV conference service will start testing from 1982.
	BT	Video conference	1982 (test started)	°Video conference network to be built by 1983. °Intra-company mount type TV conference service °CEPT planning a test of international service.
France	PTT	Video conference	1980	°2-year experimental service to judge commercial validity. °System to be installed in Paris, Renne, Nante. Also, to be installed in Lyon.
Canada	Bell Canada TCTS	Video conference	Under commercial test	°New TV conference service under test between Toronto and Thunder Bay. °Intra-company mount type TV conference service

TABLE 1.3.3.4 Videotex Planning in Each Country

Nation	Name of System or Service	Organization for Business or Test	Start of Experiment	Remarks
Japan	Captain system	Captain Center	Dec. 1979 (commercialized in 1983)	Phase II experiment started in August, 1981
UK	Brestel,	BT	Jun. 1978 (started on commercial basis in June, 1976)	
	International Brestel	BT	Mar. 1980 (started on commercial basis in July, 1981)	For international business
France	Teletel,	PTT	Jun. 1981 (to be commercialized in 1984)	Test period 18 months
	Electronic Telephone Directory	PTT	Apr. 1981 (commercialized 1982)	
West Germany	Biltshirm Text	DBP	Jun. 1980 (to be commercialized 1983)	
Netherlands	Viditel	PTT	Aug. 1980 (to be commercialized 1983)	
Switzerland	Videotex	PTT	Jul. 1980	
Finland	Telset	Helsinki Telephone Co.	Jun. 1978 (started on commercial basis in April, 1980)	
Sweden	Data Vision	Bureau of Telecommunications	Mar. 1979 (commercialized in 1982)	
Spain	Funesco	CTNE	Feb. 1980	
(In addition to the above, the system is also being planned or tested in the US, Canada, Belgium, Norway, Denmark, Italy, etc. In the US and Canada, many private firms are testing with their own systems.)				

1.4 Consideration to be made for Extension of New Services

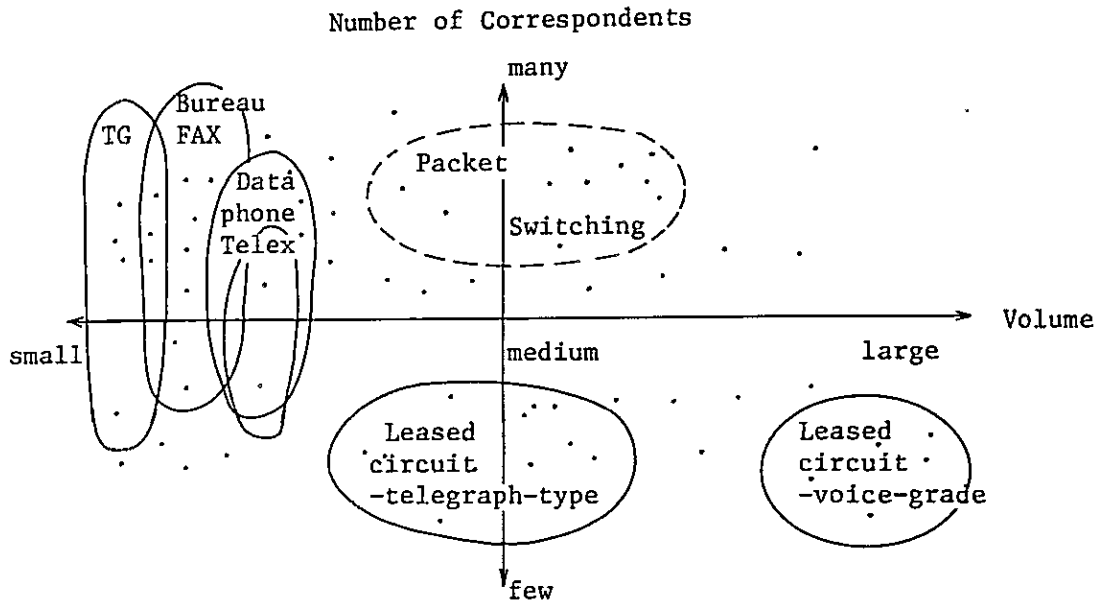
1.4.1 Needs for New Services and Answers to These Needs

At present, major services provided by international telecommunications carriers are telephone, telex, telegram, leased circuits and television transmission. These services, especially telephone, are now enjoying incredibly high popularity. But, discussion about new services are flourishing in the field of telecommunications. Why are these discussions are getting powerful? Should carriers really consider introducing new services seriously?

One of the approaches for answering this question is the analysis of user needs, service features and the comparison of these two. Suppose you are providing leased circuits (voice grade and telegraph type), dataphone (data and fax), telex, telegram and bureau fax. Let us pick up two features (or dimensions) of these services: volume of data and the number of correspondents.

As to data volume, voice grade leased circuits is considered to be used for large volume, telegraph type leased circuit for medium, dataphone for small/medium, telex for small/medium, telegram for small, bureau fax for small also. As to the number of correspondents leased circuits is mainly for point to point, dataphone for many/medium, telex for many/mediam, telegram and bureau fax for many correspondents.

You can show these two features in a two dimension diagram.



On the other hand, individual user need should also be analized and shown by dots in the same diagram. The dencity of dots shows the intensity of needs. The above diagram also shows an example of the status of user needs

In this example, substantial amount of users' needs in the upper right hand side are not satisfied yet. Some samll portions of these needs can be met by the shift or expansion of surrounding services' "positions (or territories)" through change of price and/or service quality. (In general, reduction of price would shift each position upper-right-ward to some extent.) In spite of these shift, however, major part of them may not be satisfied yet. Solution in this case is the introduction of a new service, e.g., packet switching service.

Thus, it is clear that the introduction of new services is determined by positions and intensity of user needs and the coverage of the existing services' position. In the actual introduction of a certain service, of course, many other considerations should be made including its impact on the existing services, profitability and strategy towards rival organizations. But, this analysis of service positions should be made as a first step towards organized analysis.

Table 1.4.1 shows the various service features for data communication services (both existing and new). It is needless to say that the user needs can be grasped only trhough marketing

researches. Appendix 1.4.1-1 shows an example of expected developments of existing and new communications services in the future.

Table 1.4.1 Matrix of Data Communications Services & Their Features

	Speed	Volume	Error Rate	#of Correspondents	Interactive / One Way	Communication Time	Cost	Contents
Packet Switching (including Database Access)	H	L/M	VL	B	I	S	M	C
Circuit Switching	VH	VL	VL	B	I	M	M	C
Leased Circuit-TG	L	L/M	L	F	O	L	VL	C
Leased Circuit-VG	H	L	L	F	O	L	VL	C/G
Dataphone-DATA	M	S	M	B	I	S	L	M
Dataphone-FAX	M	M/S	M	B	O	S	L	C/G
Data over Telex	L	S	M	B	I	S	M	C
Telex	L	M/S	M	B	I	S	H/M	C
Telegram	L	S	L	B	O	S	H	C
Bureau Fax	M	S	M	B	O	S	H	C/G

Data Communications Service Features (Dimensions)

1).	Speed :	High (H)	Medium (M)	Low (L)
2).	Volume :	Large (L)	"	Small (S)
3).	Error Rate (Reliability):	Low (L) (reliable)	"	High (H) (un reliable)
4).	Number of Correspondents:	Big (B)	"	Few (F)
5).	Interactive/ One Way:	Interactive (I)	"	One Way (O)
6).	Communication Time :	Long (L)	"	Shorts (S)
7).	Cost :	High (H)	"	Low (L)
8).	Contents :	Characters (C)	"	Graphics (G)

(Note) :

* In general cost is a function of all the other features.
  Cost = f (Speed, Volume, Error Rate, ... , Contents)

* V stands for very (eg., VL = Ver Low)

1.4.2 Other Considerations for the Introduction of New Services

When you are considering to introduce a new service, a question naturally arises as to when it should be introduced as well as if it should be introduced. To answer these question is not easy because the decision, whatever it may be, will inevitably bring about some consequences.

One of the most important studies is of course the financial aspect of the project (See next chapter for financial analysis). Another is the strategical consideration. Many other kind of study including technical feasibility study is needed. Here lies the necessity to make so called feasibility study, extensive as well as intensive study on the subject matter.

The technique of decision analysis may assist in its study to some extent.

1.4.3 Procedures to Introduce New Services

Different services uses different types of facilities, different operation, different pricing structure, etc. Besides different organization follows different procedures for communication, decision making and execution. Therefore, it is quite difficult to generalize the process for introducing new services, and the best procedure for one organization to introduce a certain new service is not necessarily recommendable for other organizations.

Sample procedures for database access, packet switching and INMARSAT shown in Appendices 1.4.2-1 through 1.4.2-3, therefore, are just examples. However, although the relation/connection between each step (surrounded by a box), including the direction of arrows, shown in the appendices, may not be applicable to P.T. Indosat, most of these steps are very important and can not be skipped. In this sense, these examples contain useful information.

Generalized version of procedures for new service introduction is shown in Figure 1.4.3. This is to show some important step in general, not the order of the steps.

In general, the procedures for new service introduction can be devided into three phases or portions. The first phase or portion includes routine collection and compilation of materials and information for decision making. Although this step is easily overlooked, this is very important, because this is the foundation for all the other steps. Constant monitoring of various kinds of information sources (magazines, books, reports, etc.) and preparation of summary report will create a service philosophy within the executive. When it reaches certain level, the executives are expected to hand down a decision to engage in further study on the matter. Complemental to this data source monitoring is staff proposal, request from customers and approaches from foreign carriers.

The second phase is mostly conducted by the special group of people, so called project team. While they conduct their own survey and analysis called "feasibility study", they contact and/or negotiate with all the related internal and external organizations. When necessary information is collected, necessary analysis made, and necessary coordination conducted, they will submit the result to the executives for their final decision. At this stage the executives are expected to be fully aware of major decision criteria.

If the executives' final decision is cleared, the last phase will start. At this stage, all the related internal organization will work for the inaugulation of the new services. Training of sales/technical personnel and PR activities, facility arrangement, concluding final agreement with foreign and domestic carriers are all very important steps.

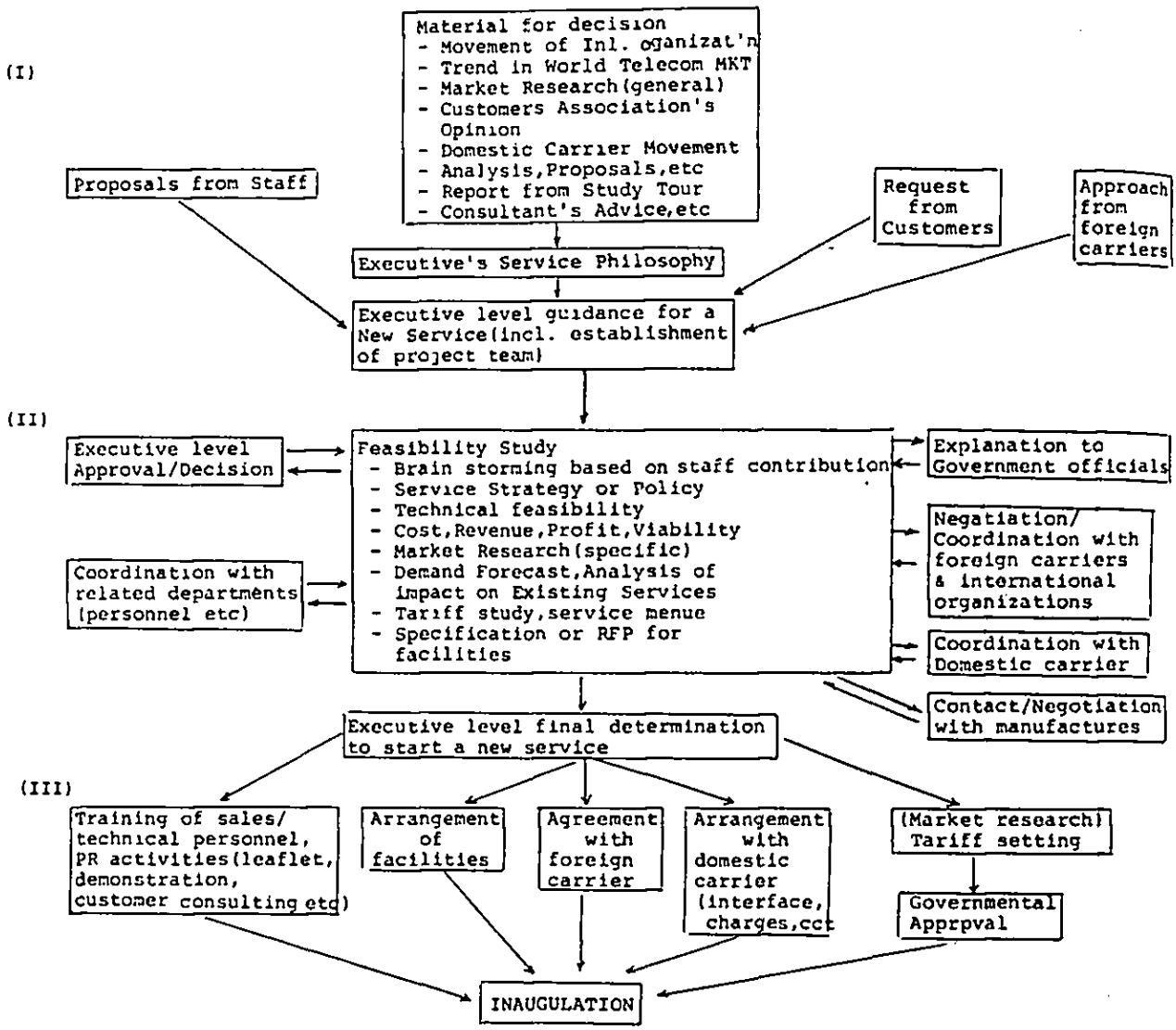


Figure 1.4.3 Introduction of a New Service (Sample Flow Chart)

CHAPTER III

2

2. General Rules to Determine Charges for International Telecommunications

2.1 Determination of Charges and Supervision and Control by the Government

P.T. Indosat is authorized to be a sole operating agency of telecommunications business under a limited company organization. The operation of P.T. Indosat is supervised and controlled by the government, in view of the sole operating agency and the public nature of the business. However, such supervision and control by the government must be kept to a minimum to support self-development and flexible management which comes from the nature of a limited company of P.T. Indosat. From this standpoint, a decision by P.T. Indosat should also have some weight in determining the charge of international telecommunications services.

2.2 Managing Organization and Charge Determination

Whatever managing form may be taken by a telecommunications business firm, certain profits are needed as income over expenses in order to execute ongoing jobs under independent compensation. However, if a limited company is compared to a public corporation, the concept of profit will somewhat differ.

More explicitly, a limited company needs to pay a reasonable dividend to shareholders because of the inherent nature of its shared stock. Therefore, it should earn a profit to cover the dividend. However, in case of a public corporation, such kind of profit is not needed. Accordingly, it shall be granted that, in case of a limited company, the pursuance of profits is more emphatically required than a public corporation, from the standpoint of management.

Although the stock of P.T. Indosat is owned presently and totally by the government, in other words, it is a government owned company, its rate policy should be the same as that of limited companies in general.

2.3 Basic Rules for Determining Charges

The following rules can be applied to determine charges for international telecommunications.

(1) A policy of overall costs compensation shall be taken. This encompasses a philosophy in which the operation costs under effective management (including depreciation costs, various taxes) and the remuneration for stock, namely overall costs should be met by the income from telecommunication charges.

Remuneration for the stock mentioned above includes interest on debt capital and compensation for equity capital. The compensation for equity capital shall reflect inflation and technical innovation to ensure sound operation of the international telecommunications business. Also, it shall be able to compensate amounts sufficient to hold real stock and cover risks accompanying the operation of the company. Further, a part of the compensation will be used to pay a dividend to shareholders at a suitable rate.

(2) International telecommunications services must be evenly and uniformly offered to the public. Therefore, no user should be discriminated against.

(3) The charge shall follow agreements on the international telecommunications charges and other international commitments and any other international customs, etc. (For major ITU Convention, regulations and recommendations for charges, see the attached data on page 40 and 41).

2.4 Other Factors to be Included

(1) Cross Subsidization between Services

Among a number of services, cross subsidization shall be avoided, i.e. losses in one service are compensated by the profits from other services. Because, otherwise, equipment will not be used effectively and profits and losses will not be properly judged. However, if services operating at a loss are deemed necessary and reasonable for the welfare of a society, internal mutual assistance shall be permitted a limited basis, as follows.

(1) The development of a new service is recognized as necessary and a less appears during the beginning period, yet it is expected to turn a profit in the near future.

(2) For a service at the end of its useful life when it is strongly requested by users and is not replaceable by other method.

(3) When a service operating at a loss is intended for public use or to fill the needs of society and is strongly needed by consumers in view of equal compensation.

(2) Factors to be Considered in Determining an Individual Service Rate

To determine an individual service rate, the foregoing general rules shall be used. In addition, the following factors should be taken into account.

In determining each service rate, the cost of the service shall be used as a basis. Also, various other factors should be considered, e.g. price elasticity of demand, the nature of the service (efficacy, relationship to other services), attributes of the market, historical conditions of rates, long-term stability of rates, simplicity, etc. As to financial analysis in general, refer to Appendix 2.4-1.
As to price elasticity of demand, refer to Appendix 2.4-2.

Furthermore, the ITU Convention, regulations, recommendations, the INTELSAT agreement, contracts and other international commitments and habits shall also be referred to, together with charges set by other countries, international competition, etc.

(3) Accounting Rate and Collection Charge

To agree with other countries on the accounting rate, care should be taken to avoid significant differences in the collection charge and the rate systems. However, the effect on income and the negotiating problems with partner countries shall also be comprehensively studied with a flexible attitude.

Attached Data

Abstracts from the Rules for Rate Determination, as Described in the International Telecommunication Convention, etc.

1 Convention

° Foster collaboration among its Members with a view to the establishment of rates at levels as low as possible consistent with an efficient service and taking into account the necessity for maintaining independent financial administration of telecommunication on a sound basis; (Article 4; 18)

(Note) In addition, it is also stipulated that the gold franc be used for the money unit.

2 Regulations

° To determine the collection charge, efforts shall be taken to avoid any significant difference in the rates used by both parties under the same relationship. (Telegram 7, telephone 7).

3 Recommendation D.5

° Total income for services shall be sufficient to meet all costs under sound management, including interest on capital. (But should not exceed it.)

° Rate level for each service shall be able, in general, to meet necessary costs.

° However, approval can be given to services operating at a loss for political or social reasons and assistance given thereto from other services. But, in this case, the following stipulation shall be made.

* In all cases, injurious competition shall not be allowed

between services offered by the relevant telecommunications organization.

* In receiving assistance from other jobs, the value of the service operating at a loss shall be evaluated.

4 In the D-series recommendations other than D.5, conclusions for an international agreement are shown for the rate components for each service, after a study of each factor in the actual phases in each country. For instance, a minimum charge for manual and semi-automatic calls shall be set for 3 minutes (D.100), leased lines shall be paid by terminal charges to each governmental office (D.1), charges for packet switching shall be based also on connecting hours and minutes as well as on the amount of transmitted information (D.10), and so forth.

CHAPTER III

3

3. Demand Forecast

3.1 Premises for Demand Forecast

3.1.1 Trends in Population, Economy, and Trade

According to a census taken in 1980, Indonesia has a population of 147,490,298 people on October 31 of that year. Compared with the 1971 records showing 119,208,229 people, the new figures represent an average annual increase of 2.4%. Gross Domestic Product (GDP) as an index of economic activities recorded 10,954 billion ($\times 10^9$) Rupiah in 1980 (based on a 1973 price), increasing at an average annual rate of 7.8% since 1970 when Indonesia's GDP was 5,182 billion Rupiah (based on a 1973 price structure).

Needless to say, the growth of Indonesia's economy has been supported by favorable exports centered on oil. As data to show trade values, there are two bases - one using payments and the other using customs clearance. The Bank of Indonesia and the Central Bureau of Statistics publish figures on these two bases. According to the former figures, exports and imports in 1980 amounted to US$21,573 million and US$12,510 million, respectively. In 1970, Indonesia's exports totaled US$1,173 million, and imports, US$1,116 million. Indeed, exports and imports have, therefore, been increasing at rates of 33.8% and 27.3% a year.

Figure 3.1.1.1 shows the transition of GDP (in both real and nominal terms) and Fig. 3.1.1.2 that of trade (in FOB basis).

The World Bank, other economic forecast institutions as well as various project plans in Indonesia forecast Indonesia's population, GDP, trade values, etc. Our demand forecast for international telecommunication services has conferred with these forecasts. Also, our own trial to forecast GDP have been made and shown in Appendix 3.1.1-1.

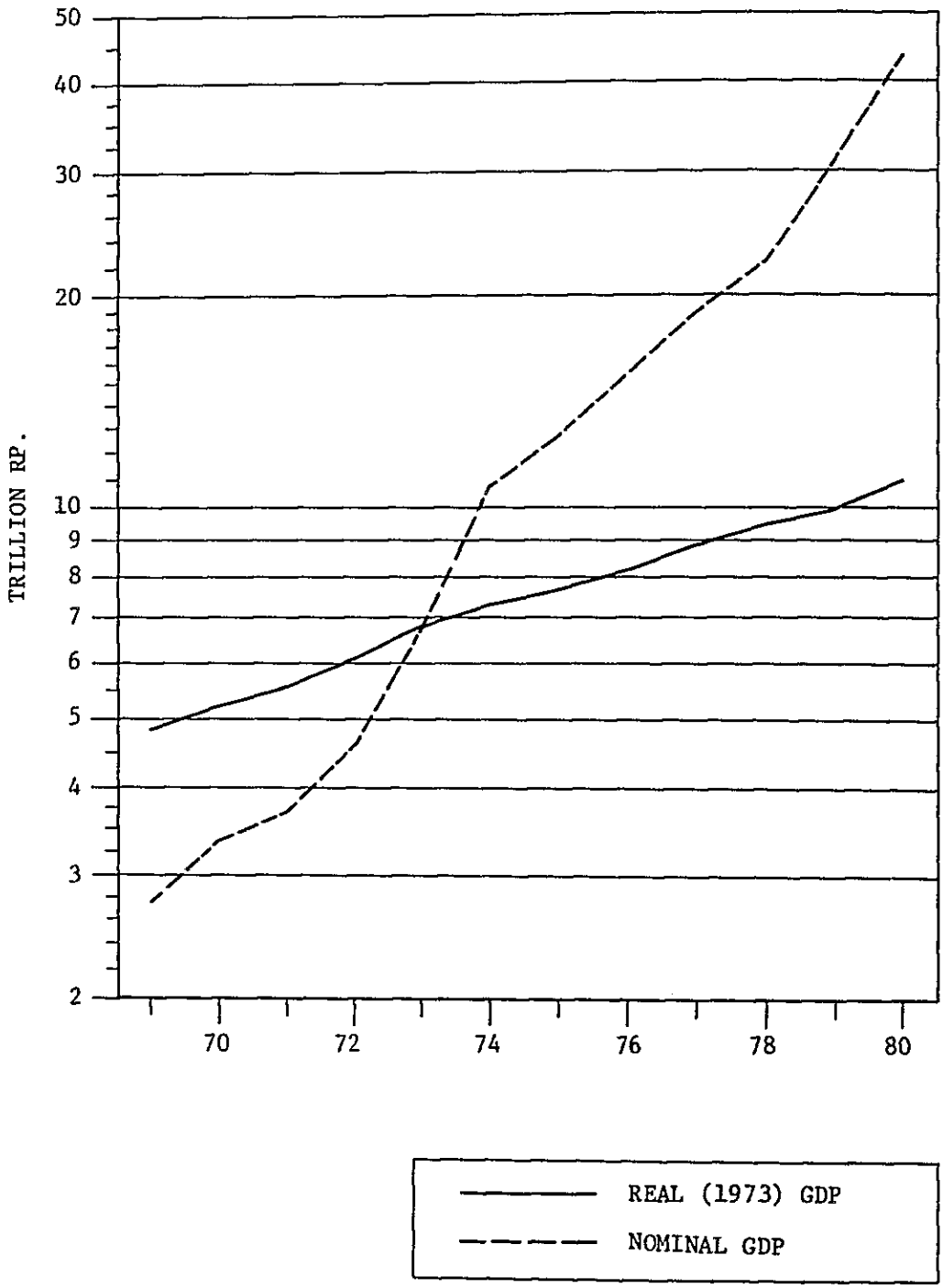


Fig. 3.1.1.1 Gross Domestic Product

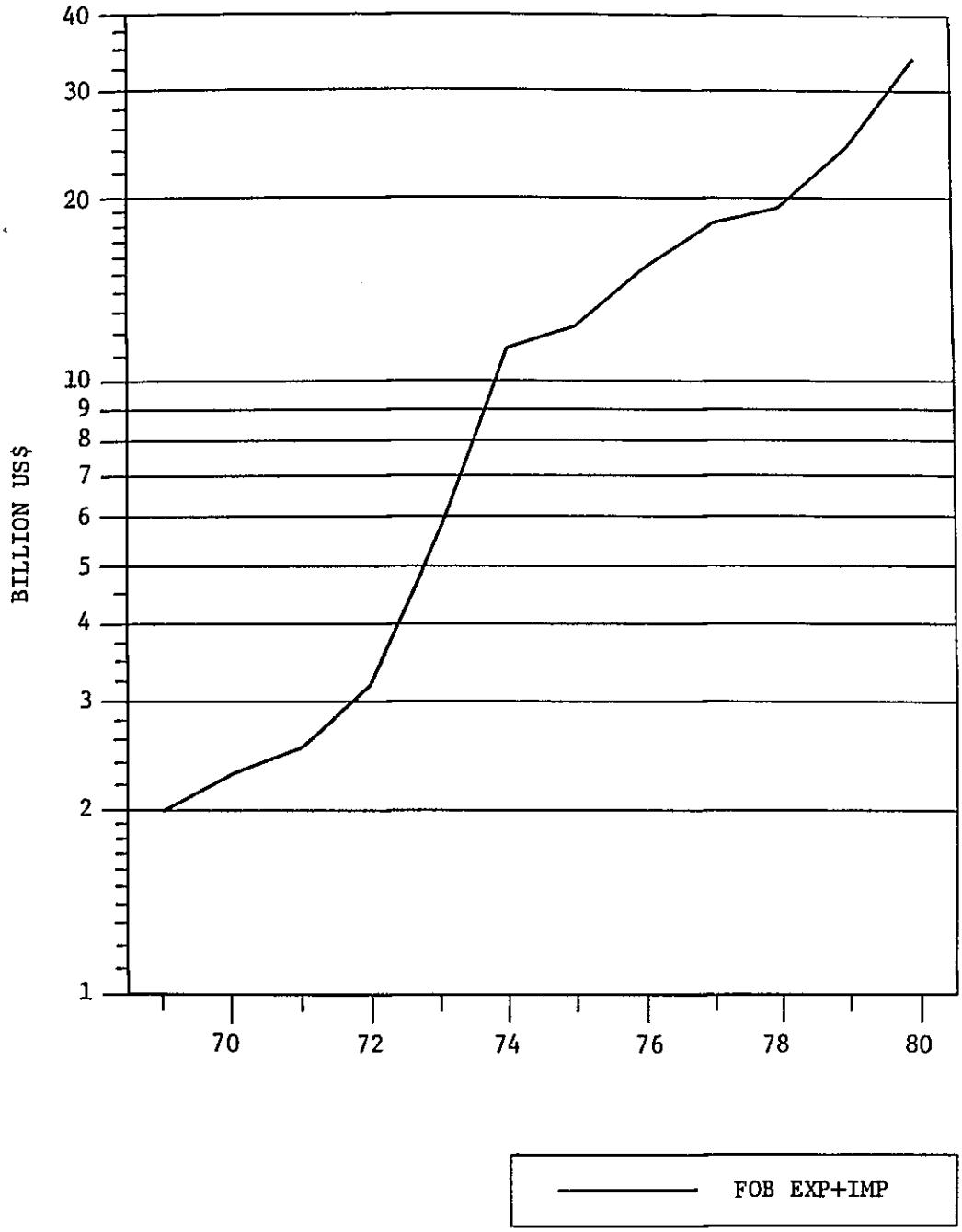


Fig. 3.1.1.2 Trade (Exports + Imports)

3.1.2 Geographical Aspect of Indonesian Economy

Indonesia is an island country with more than ten thousand islands. Among these, two of the large islands, Jawa and Sumatra, play an important role in the economy of the country.

In 1980, the Sumatra and Jawa islands account for 19 percent and 62 percent of the total population respectively. And as to the value of exports in the same year, the former takes 58 percent and the latter 6 percent in the total amount, and as to that of imports, the former 14 percent and the latter 75 percent respectively.

In the international telecommunications field, however, Sumatra is at present resigned to relatively small percentage share in the total Indonesian traffic, while Jawa is enjoying substantially large share. In the international telephone, Sumatra takes only 6.9 percent while Jawa takes 90.1 percent. And in the telex, Sumatra takes 6.5 percent and Jawa 90.8 percent.

This phenomena is partially explained by the fact that most of the traffic share of Jawa comes from Jakarta, the commercial as well as political center of Indonesia. But, this also implies that still unsatisfied demand is waiting to be realized especially in Sumatra.

Fig. 3.1.2 WITEL Allocation of Indonesia

3.2 Current Status of Traffic

3.2.1 International Telephone

International telephone calls originating in Indonesia have shown a prominent increase in recent years. In 1980, a total of 1,174,522 calls were made, totaling 9,050,900 minutes.

In 1970, the total number of calls was 76,184, totaling 546,940 minutes. In the past decade, therefore, the number of calls has increased 15.4 times (average annual growth: 31.5%), and total minutes, 16.5 times (average annual growth: 32.4%).

The growth tempo shows no signs of losing momentum even recently due to the start of ISD service, the improvement in domestic network and the introduction of new facilities. In terms of total telecommunication minutes, the telephone has surpassed telex and is catching up in the number of calls, as well.

Appendix 3.2.1-1 shows the historical data for chargeable calls and minutes of international telephone originating from and terminating in Indonesia.

Appendix 3.2.1-4 shows the same data broken down by WITEL, based on the share of each WITEL in outgoing traffic complied by PERUMTEL. The traffic data available on a country by country basis is only that for June 1982, and is shown in Appendix 3.2.1-2.

3.2.2 International Telex

International telex originating in Indonesia has also been growing steadily, as is the case with international telephone calls, in conjunction with the penetration of telex terminals and the growth of international trade. P.T. Indosat's statistics show 2,735,679 telex messages were sent from Indonesia in 1981, totaling 8,818,938 minutes. They compare with 124,827 messages and 647,520 minutes for 1971. In the past 10 years, therefore, each has increased 21.9 times (average annual growth: 36.2%) and 13.6 times (average annual growth: 29.8%), respectively.

The ratio of international telex messages terminating in Indonesia, according to the financial data of P.T. Indosat, is estimated to be as follows in this master plan:

ASSUMPTION: International Telex OUT/IN Ratio

	OUT	IN
Up to 1980	50	: 50
1981	54	: 46

Appendix 3.2.2-1 shows the total number of chargeable calls and minutes originating from and terminating in Indonesia estimated on this assumed OUT/IN ratio.

The plan adopted the country-by-country telex traffic data compiled by ITU, as shown in Appendix 3.2.2-2. One characteristic of that is that the proportions of Singapore, Japan, the United States, and Europe are very high. Appendix 3.2.2-4 shows the history of total chargeable minutes for telex broken down by WITEL. WITEL IV that covers Jakarta accounts for approximately 84% of total traffic.

3.2.3 International Telegram

Unlike international telephone and telex, international telegrams originating in Indonesia have been decreasing since their peak in 1974. Compared with 493,747 telegrams sent in 1974, 205,893 telegrams were sent in 1981, decreasing to less than half in 7 years (0.42 times, average annual reduction rate: 11.7%).

Decreases in international telegrams are a worldwide trend, and this can be attributed to the shift to telex and, recently, to facsimile communications by the telephone network.

The proportion of outgoing messages is higher than that for incoming messages in international telegram, unlike in international telephone and telex. The following assumed ratios were used in the estimated numbers of total telegrams sent and received which is shown in Appendix 3.2.3-1.

ASSUMPTION: International Telegram OUT/IN Ratio

	OUT	IN
Up to 1981	59	: 41

3.2.4 International Leased Circuits

Records of the number of circuits (including estimates) are shown in Appendix 3.2.4-1. This service has also shown a steady increase since its introduction in 1969. The number has increased almost ten-fold in the past 13 years. (14 in 1969 and 142 in 1982) This service is divided into telegraph-type and voice-grade. The ratio of the latter to the former is still small (10.6 percent in 1982). But, a radical shift has recently been observed from telegraph-type to voice grade in general.

3.2.5 International Television Transmission

Records of traffic are shown in Appendix 3.2.5-1. Although the demand for this service has fluctuated depending on the existence of epoch-making events, it also seems to be following the general growing trend of international telecommunications.

3.2.6 Recommended Compilation of Telecommunications Traffic

To the convenience for P.T. Indosat to improve their planning process, recommended data items to be compiled, structure of traffic data and sample formats are shown in Appendices 3.2.6-1, 3.2.6-2 and 3.2.6-4 respectively.

3.2.7 Comparison of Indonesian International Telecommunications with Those of Other ASEAN Countries

While Indonesia is showing a prominent increase in international telecommunications traffic, other ASEAN countries are also enjoying similar growths in the field.

According to the ITU data (Appendix 3.1.2-1), in the international telephone service from 1971 to 1980, Malaysia, Singapore, the Philippines and Thailand have experienced an average annual growth rate of 31.4, 29.3, 23.6 and 18.7 percent respectively while that of Indonesia has been 22.6 percent (see Fig. 3.2.7.1). On the other hand, in the international telex, the average annual growth rates of these countries for the same period are 42.6 (Malaysia), 46.7 (Singapore), 22.1 (Philippine), 41.9 (Thailand) and 37.5 (Indonesia) percent (see Fig. 3.2.7.2).

These progress can be, in general, attributed to the active development in the economy and other fields in this region as is often mentioned. But as the difference in growth rates exists, the efforts made in the telecommunications field play an important role in the development of this service.

Figures 3.2.7.3 and 3.2.7.4 shows the scatter diagrams of the five ASEAN countries for telephone and telex traffics vis-a-vis export amounts. Although the international trade is not the only variable for the function of the international traffic, the diagrams imply that there is still substantial amount of unsatisfied potential demand in international telecommunications especially for Indonesia.

The table below shows the basic data used to draw the scatter diagrams.

(year of 1980)

Country	Exports in Million $	International telephone calls (10^3)	International telex calls (10^3)
Indonesia	21,757	1,354	2,191
Malaysia	12,868	689*	4,637
Singapore	19,359	3,530	6,855*
Philippines	5,789	2,105	3,072*
Thailand	6,449	873	1,514*

Source: ITU, Yearbook of Common Carrier Telecommunication Statistics (Those with * are estimates based on the data in this book and the KDD experience.)

Chase Econometrics, Far East Forecast

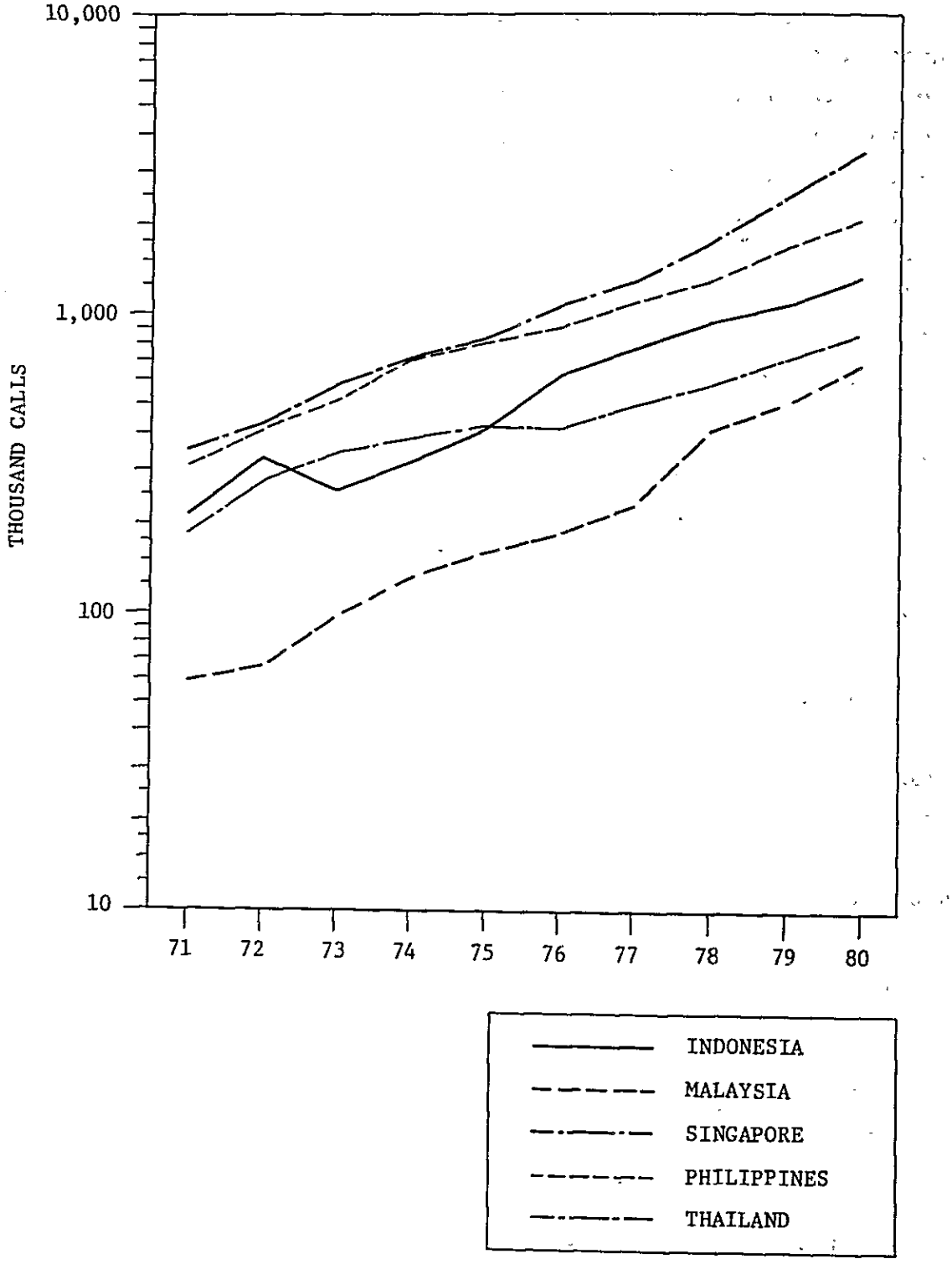


Fig. 3.2.7.1 International Telephone in ASEAN

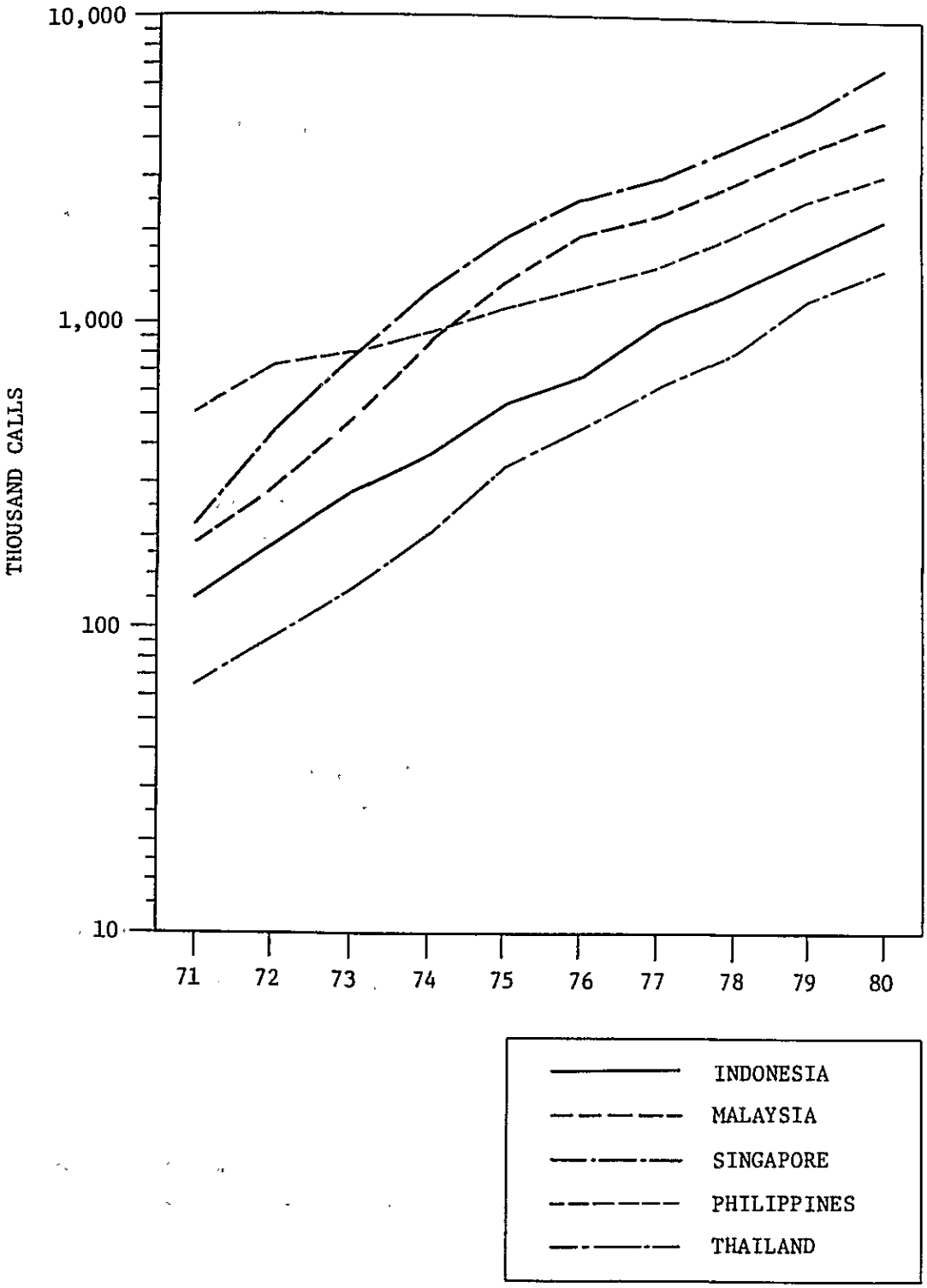


Fig. 3.2.7.2 International Telex in ASEAN

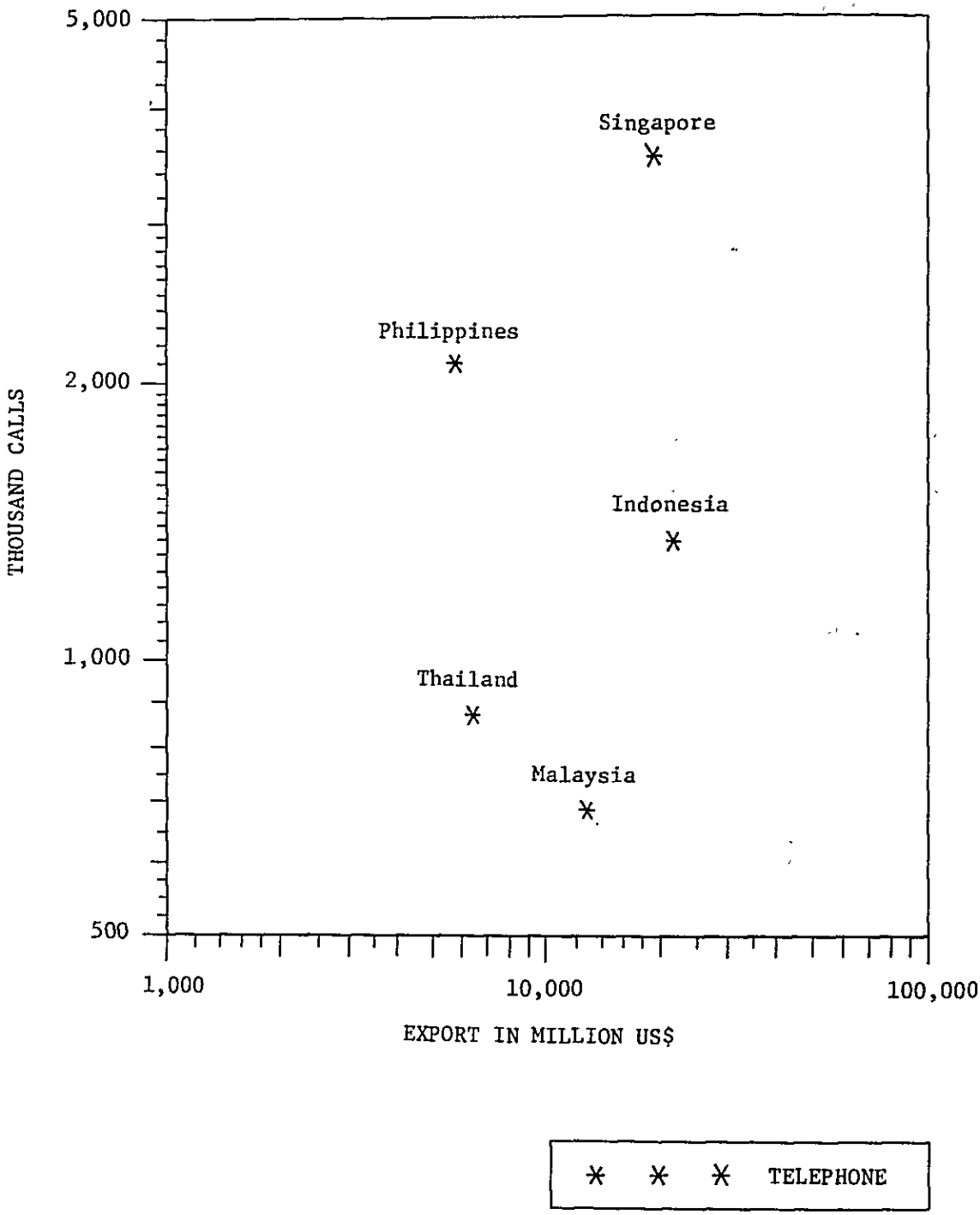


Fig. 3.2.7.3 International Telephone vs. Trade

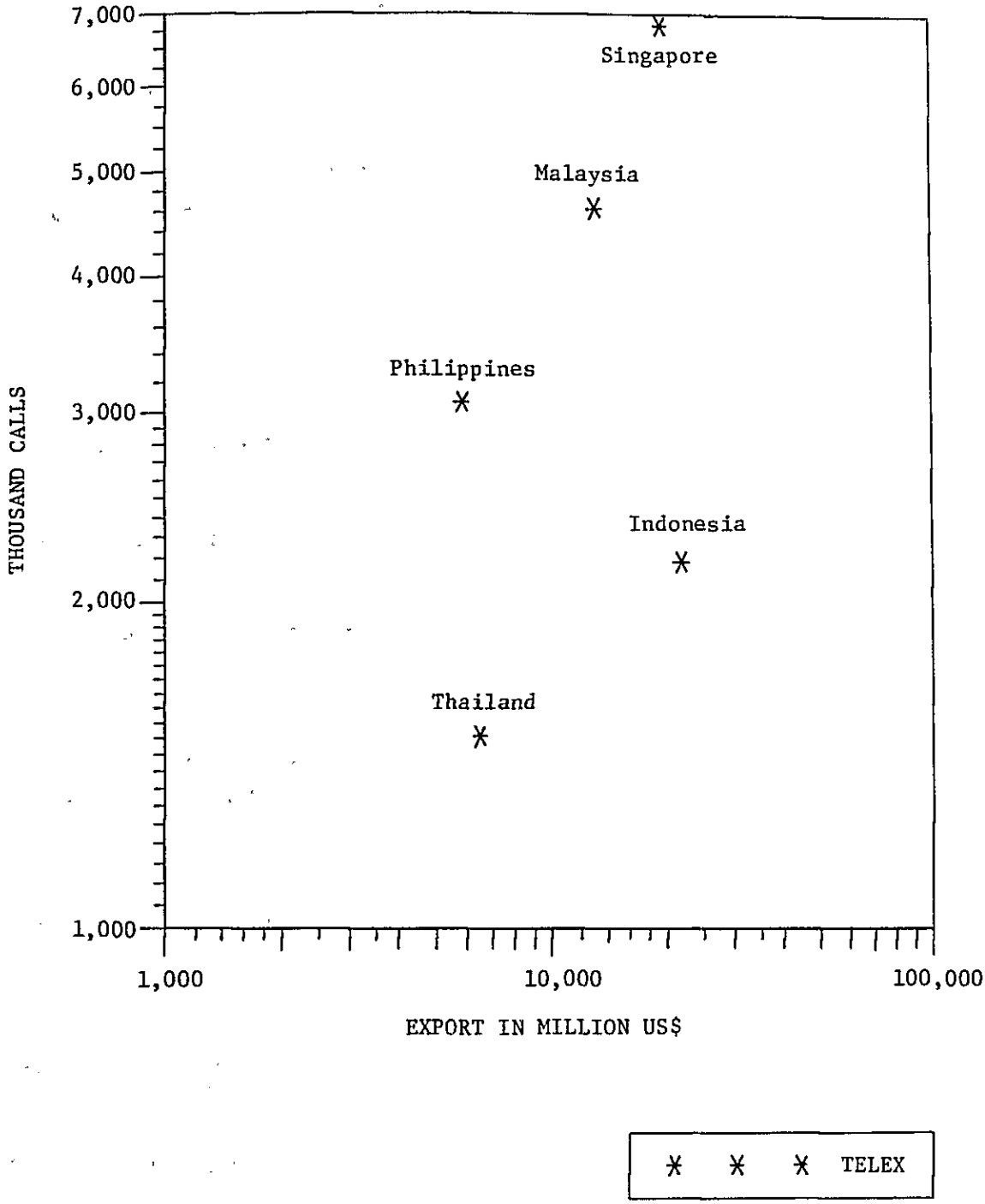


Fig. 3.2.7.4 International Telex vs. Trade

3.3 International Telephone Demand Forecast

3.3.1 Forecast of Total Chargeable Minutes (Outgoing + Incoming)

The total chargeable minutes of international telephone to and from Indonesia from 1983 through 1990 have been forecasted based on the following parameters:

a. basic growth rate, which consists of rate of growth by popularization of the service and that by increase in foreign trade and tourism.

b. impact on growth of introduction of full automatic operation (ISD) and new international facilities

c. impact on growth of enhancement in domestic network (e.g., improvement in completion rate)

d. impact on growth of additional increase in subscribers

The method of getting the growth rate for each planned year is first to obtain item a. above and to estimate items b., c. and d. respectively, and then super-impose b., c. and d. on a. (See Appendix 3.3.1(1).)

The fundamental growth rate of international telephone traffic has been obtained by fitting the following exponential curve to the historical data through the method of least squares:

$$\log_{10} \text{TPMTOT} = -2.22062 + 0.08049 * \text{YEAR} \quad (R^2 = 0.999)$$

(TPMTOT: total telephone minutes
YEAR: the last two digits of the Christian era

From this formula, the basic annual growth rate has been estimated to be 20 percent, because $10^{0.08049} = 1.2036$.

As to the super-imposing growth rates by introduction of full automatic operation and new facilities, enhancement in domestic network and additional increase in subscribers, the estimated figures based upon various kinds of studies including Indosat's are shown below together with basic and total growth rates.

Year	Basic growth	ISD/ new facilities	Domestic network	Sub-scribers	Total growth
1983	20.0	6.1	3.0	4.0	33.1
1984	20.0	5.0	2.0	1.5	28.5
1985	20.0	4.0	1.2	1.0	26.2
1986	20.0	2.5	0.2	0.3	23.0
1987	20.0	2.5	0.4	0.3	23.2
1988	20.0	2.0	0.3	0.2	22.5
1989	20.0	1.5	0.3	0.2	22.0
1990	20.0	--	--	--	20.0

(Note: The total telephone minutes for 1982 is set at 40,045 thousands.)

In the long range forecasting, the degree of uncertainty increases, and saturation effect cannot be avoidable even for currently growing services as telephone. Therefore, a common practice in long range forecasting is to chose as a fitting curve one of growth curves, such as Gomperz or logistic curve. In this master plan, the international telephone traffic for the remaining period up to the year 2000 has been forecasted by the following Gomperz curve formula:

$$TPMTOT = 1{,}618{,}270 * (0.017682)^{0.923273^{t}}$$

(TPMTOT: total telephone minutes
t = 1:1982
2:1983
: :
: :

The forecasted demand for international telephone traffic calculated by the above is shown in Table 3.3.1.

Table 3.3.1 International Telephone Traffic Forecast
Indonesia—World
(Outgoing + Incoming)

Year	Calls (thousands)	Minutes (thousands)	Average Minutes per call
1983	7,301	53,295 (33.1)	7.30
1984	9,551	68,484 (28.5)	7.17
1985	12,673	86,427 (26.2)	6,82
1986	16,304	106,305 (23.0)	6.52
1987	20,921	130,968 (23.2)	6.26
1988	26,518	160,436 (22.5)	6.05
1989	33,175	195,731 (22.0)	5.90
1990	40,707	234,877 (20.0)	5.77
1994	72,701	387,498	5.33
1999	126,584	620,264	4.90
2000	138,511	667,623	4.82

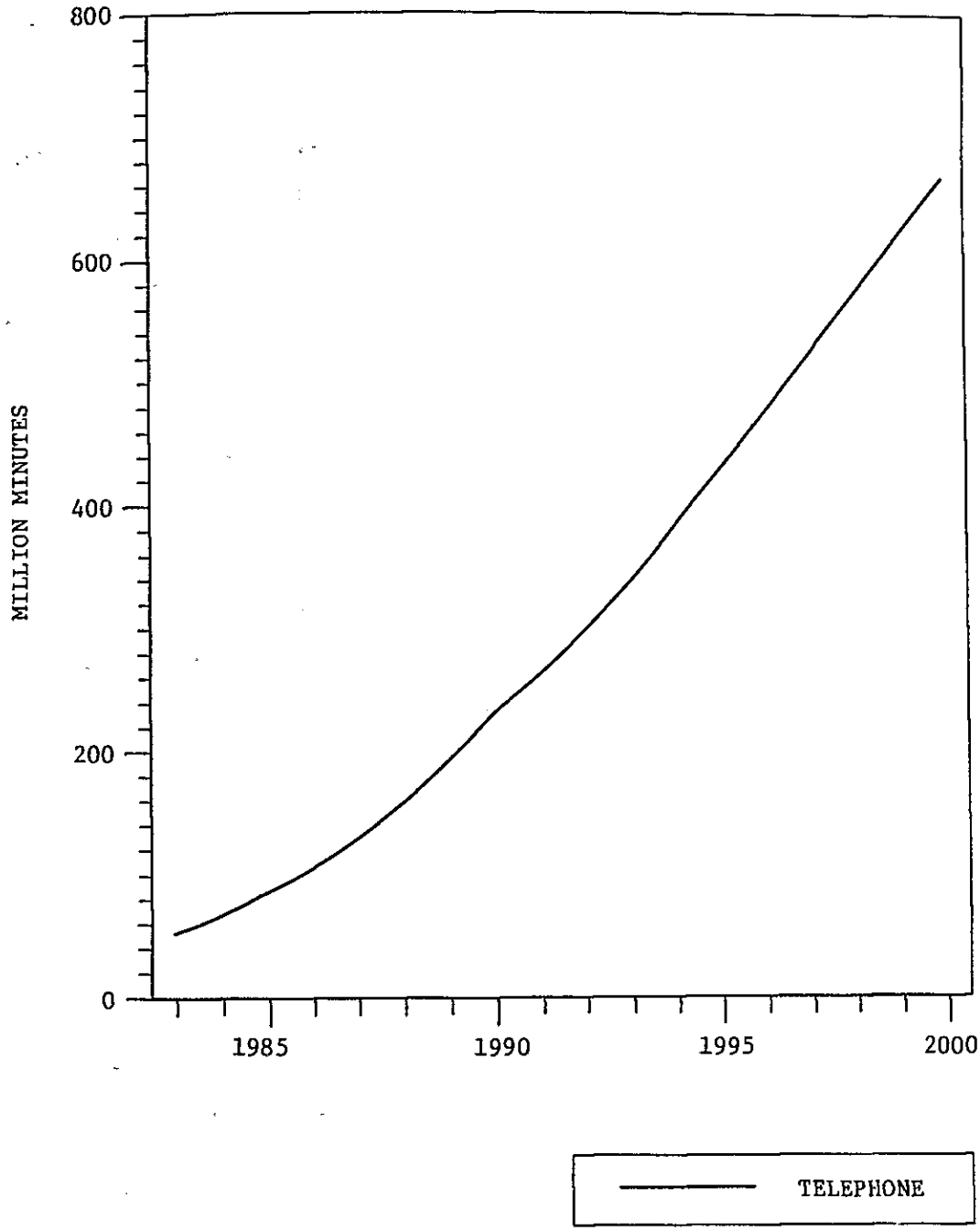


Figure 3.3.1 International Telephone

3.3.2 Forecast of Annual ISD Utilization Ratio (Outgoing + Incoming)

The forecast of ISD ratio for 1980 through 1987 has been estimated based on the data shown by P.T. Indosat, the ISD utilization ratio for the coming 5 year in Japan forecasted by KDD, and other information and data. The forecast after 1988 has been made based on the following mathematical formula:

$$\log Y = 1.83918 - 0.256299 * (0.771043)^{t}$$

Y: annual ISD utilization ratio (%)
t = 1:1982
2:1983
: :

The forecast by each gateway has also been made based on the assumption that in this respect the second gateway would catch up with the first gateway in four years, i.e., it takes four years for the ISD ratio in Medan to catch up with Jakarta level, which is also progressing.

The forecasted ratio by gateway and for total Indonesian traffic is shown in Table 3.3.2.

Table 3.3.2 ISD Utilization Ratio

Year	Jakarta		Medan		Indonesia Ratio (%)
	ISD(%)	Call(%)	ISD(%)	Call(%)	
1983	48	100	—	—	48
1984	57	91	30	9	55
1985	62	90	48	10	61
1986	67	89	61	11	66
1987	70	88	70	12	70
1988	73	87	73	13	73
1989	75	86	75	14	75
1990	76.5	85	76.5	15	76.5
1994	81	83	81	17	81
1999	84.5	80.5	84.5	19.5	84.5
2000	85	80	85	20	85

3.3.3 Forecast of Average Chargeable Minutes (Outgoing + Incoming)

First, the average chargeable minutes have been estimated for ISD and non-ISD calls respectively. For ISD, the following formula has been used based on KDD's experience:

$$Y = 1 + 4.2137 * (0.98249)^{t}$$

Y: ISD average chargeable minutes per call
t = 1: 1980

Average chargeable minutes for non-ISD calls have been considered to be 10 minutes (constant) based on the trend observed by KDD.

Those for total telephone minutes have been obtained by taking the weighted average of those for the above two categories. The result is shown in Table 3.3.

3.3.4 Forecast of Outgoing and Incoming Ratio

The estimated outgoing telephone traffic in minutes in 1982 is 18,218 thousands, and that for incoming 21,829 thousands. Thus, the OUT:IN ratio in 1982 is 45.5:54.5.

The recent trend indicates even bigger ratio for incoming traffic in 1983, 23,801 thousand minutes (44.7) for outgoing and 29,494 thousand minutes (55.3) for incoming. The formula to arrive at the above figures are the following:

$$Y_o = 12,538.2 + 469.269 * t \quad (R^2 = 0.998)$$

$$Y_i = 14,135.7 + 639.927 * t \quad (R^2 = 0.999)$$

Y_o: twelve month moving sum of outgoing monthly traffic
Y_i: twelve month moving sum of incoming monthly traffic
t = 1: January 1982

Table 3.3.4.1 ISD Utilization Ratio and Average Chargeable Minutes

Year	I S D		Non-ISD		Weighted Min/Call
	Ratio(%)	Min/Call	Ratio(%)	Min/Call	
1983	48	4.93	52	9.50	7.30
1984	55	4.86	45	10.00	7.17
1985	61	4.79	39	10.00	6.82
1986	66	4.72	34	10.00	6.52
1987	70	4.66	30	10.00	6.26
1988	73	4.59	27	10.00	6.05
1989	75	4.53	25	10.00	5.90
1990	76.5	4.47	23.5	10.00	5.77
1994	81	4.23	19	10.00	5.33
1999	84.5	3.96	15.5	10.00	4.90
2000	85	3.90	15	10.00	4.82

In the long run, however, the ratio is expected to be 50:50. The forecasted ratio for the planned year is shown in Table 3.3.4.2.

Table 3.3.4.2 International Telephone Incoming: Outgoing Ratio

Year	OUT	IN	Total
1983	44.7	55.3	100.0
1984	45.5	54.5	100.0
1985	46.5	53.5	100.0
1986	47.5	52.5	100.0
1987	48.5	51.5	100.0
1988	49.5	50.5	100.0
1989	50.0	50.0	100.0
1990	50.0	50.0	100.0
1994	50.0	50.0	100.0
1999	50.0	50.0	100.0
2000	50.0	50.0	100.0

3.3.5 Forecast of International Telephone Traffic Broken Down by Country

Preferably, forecasts should be made for countries the traffic to and from which exceeds 1,000 minutes per year and for the total remaining traffic based on the historical data and other factors. An example of methods appropriate for this purpose is the following:

$$\text{Growth rate for country X for the planned year} = \frac{\text{Average growth rate of that country for the past 5 years}}{\text{Average growth rate of the macro traffic for the past 5 years}} \times \text{Growth rate of macro traffic for the planned year}$$

Following this task, these forecasted traffics should be totalized and compared with the macro traffic forecast. Finally, if necessary, adjustment must be made.

However, during our survey period, the data available in this respect was only those for the monthly traffics of June 1982 (Appendix 3.2.1-2). Therefore, for this master plan, the country-by-country forecast has been made assuming that the shares for June 1982 for each country will continue until the year 2000.

Appendix 4.4.1-3 shows the forecast result.

The reason why we recommend that this forecast should be made in spite of time and energy is explained in Section 4.2.

3.4 International Telex Demand Forecast

3.4.1 Forecast of Total Chargeable Minutes (Outgoing + Incoming)

The method for forecasting the telex traffic is basically the same as that for telephone, although in the case of telex a certain parameter is to be infra-imposed instead of being super-imposed. The following parameters have been considered for forecasting the traffic between 1983 and 1990:

a. basic growth rate, which consists of rate of growth by increase of line units and that by increase in foreign transactions.

b. impact on growth of domestic network improvement

c. reverse impact on growth of popularization of new services such as data communications and facsimile.

The basic growth has been obtained by getting the following exponential fitting curve:

$$\log_{10} (TXMTOT) = -2.04805 + 6.07726 * YEAR \quad (R^2 = 0.994)$$

(TXMTOT: total telex minutes
YEAR: the last two digits of the Christian era

From this, the basic annual growth rate has been estimated as 19.5 percent because $10^{0.07726} = 1.1947$.

Other parameters and the total growth rate for the planned years is shown below.

Year	Basic growth	Domestic network	New services	Total
1983	19.5	—	-3.0	16.5
1984	19.5	1.5	-4.0	17.0
1985	19.5	2.5	-5.0	17.0
1986	19.5	2.0	-6.0	15.5
1987	19.5	1.5	-7.0	14.5
1988	19.5	1.5	-8.0	13.0
1989	19.5	1.5	-9.0	12.0
1990	19.5	1.5	-10.0	11.0

(Note: The total telex minutes for 1982 is set as 20,384 thousands.)

Because of the same reason as is explained for the long range telephone traffic forecast, the forecasts of telex traffic for the remaining years up to the year 2000 has been made on the following Gomperz curve:

$$TXMTOT = 108{,}800.0 * (0.201979)^{0.869602^t}$$

(TXMTOT: total telex minutes
t = 1: 1984

The forecasted demand is shown in Table 3.5.

3.4.2 Forecast of Average Chargeable Minutes (Incoming + Outgoing)

Average chargeable minutes for incoming and outgoing international telex have been forecasted based on the following formula:

$$y = 1 + 3.159147063 \times (0.931872)^t$$

y: Average chargeable minutes per call of international telex

t = 1, 2, ... : 1975, 1976, ...

Table 3.4 International Telex Traffic Forecast
Indonesia—World
(Outgoing + Incoming)

Year	Calls (thousands)	Minutes (thousands)	Average Minutes per call
1983	8,105	23,747 (16.5)	2.93
1984	9,923	27,784 (17.0)	2.80
1985	12,175	32,507 (17.0)	2.67
1986	14,666	37,546 (15.5)	2.56
1987	17,547	42,990 (14.5)	2.45
1988	20,672	48,579 (13.0)	2.35
1989	24,074	54,408 (12.0)	2.26
1990	27,703	60,393 (11.0)	2.18
1994	40,811	77,133 (4.6)	1.89
1999	56,601	91,694 (2.3)	1.62
2000	59,343	93,762 (2.0)	1.58

3.4.3 Forecast of International Telex Broken Down by Country

The forecast of international telex traffic after 1983 broken down by country has been made by assuming that the shares held by each country in 1980 will continue up to the year 2000. It is recommendable, however, that after accumulating appropriate amount of data P.T. Indosat should recalculate the estimated traffic for each country.

Appendix 4.4.1-3 shows the result of forecasting.

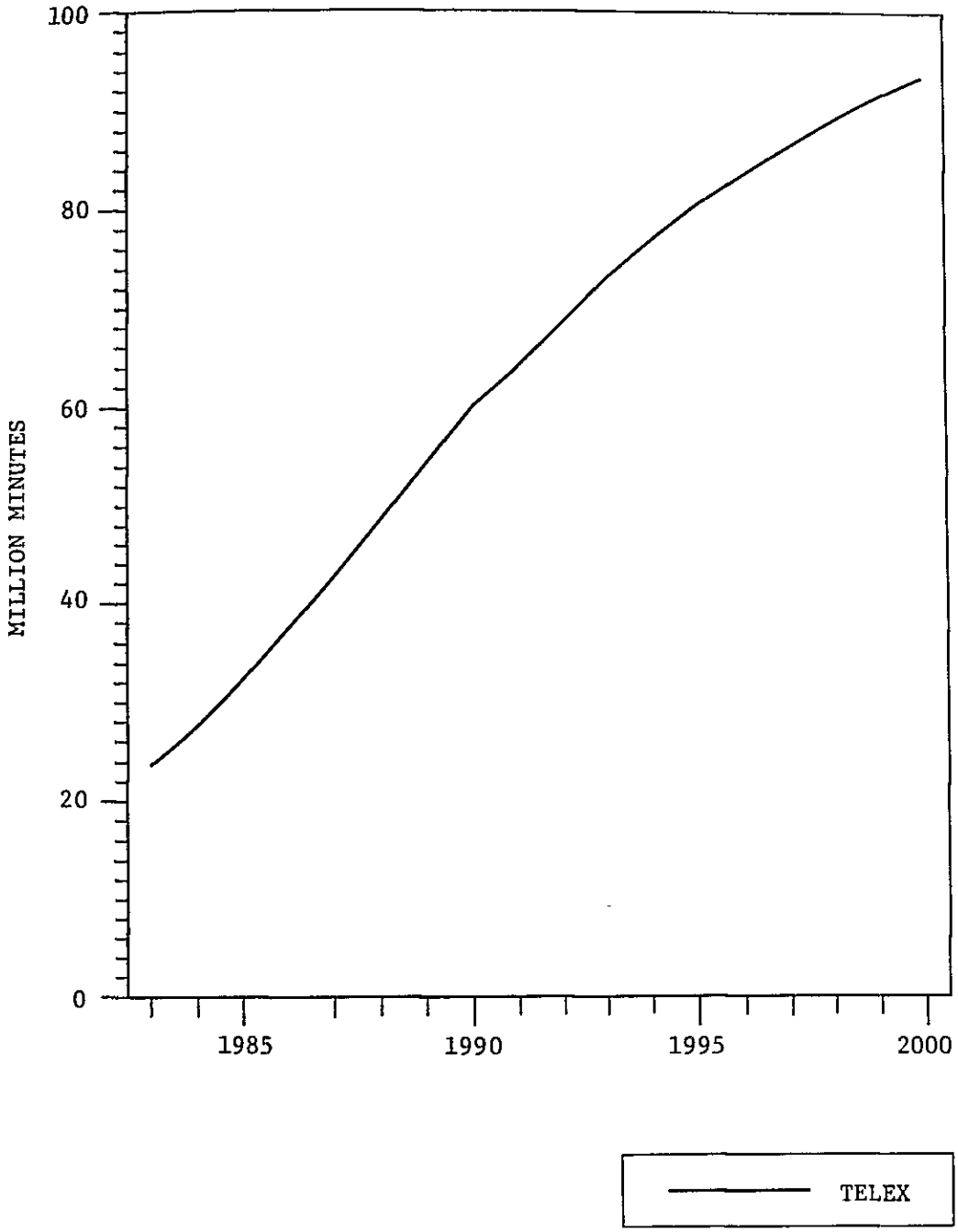


Figure 3.4.2 International Telex

3.5 Ratio of Telephone and Telex Traffic Handled by Jakarta and Medan Gateways and Traffic Forecast by WITEL

In 1980, the international telecommunication traffic originated in Sumatra accounted for approximately 7% of Indonesia's total telecommunication traffic. (The rate for telex messages is about 5% as traffic to/from Palembang of WITEL III is handled in Jakarta.) The ratio has changed little in the past several years. However, considering the proportion of population which Sumatra occupies in Indonesia's total population (19.0%), its proportions of Indonesia's total exports (58.2%) and imports (14.4%), and its proportion of Indonesia's total foreign residents (33.5%), the potential demand in Sumatra seems to be substantially large. The master plan estimates as a tentative criterion that, by 2000, 20% of total traffic, both terminating and originating, will be generated in Sumatra. This estimation has been made based on the proportion of resident foreginers, particularly people from ASEAN countries, Japanese, Indians, and Europeans (19%) with the exception of the Chinese population, which is quickly assimilating into the local populace, in addition to the population ratio mentioned earlier. A weighted average of imports and exports (43.7%) has also been considered. An increase effect through a service enhancement due to the opening of the Medan Gateway Office (up approx. 30% over the current transition) can also be anticipated. Taking these factors into consideration, the following assumption has been made in this master plan.

ASSUMPTION: Medan's Proportion in Total Traffic of Indonesia

	80~83	84	85	86	87	88	89	90	94	99	2000
Telephone	7	9	10	11	12	13	14	15	17	19.5	20
Telex	5	7	8	9	10	11	12	13	15	17.5	18

Expansion and improvement of the domestic telecommunication network will, of course, play the most important role in actualizing the potential demand. In the table shown above, an assumption has been made that these expansions and improvements will be steadily implemented every year.

The above ratio is an assumption of the Sumatra's proportion in the total traffic. Therefore, Sumatra's ratio for traffic to/from each country should preferably be calculated separately based on the historical data by country. However, past data on a country by country basis is lacking. Such being the case, the foregoing ratio has been used uniformly in making the forecast by country and by gateway in this master plan.

Regarding the transition of traffic broken down by WITELs, as is the case with the change in traffic by gateway, data need to be accumulated separately for incoming and outgoing traffic, and the transition will have to be watched. However, for the moment, the following assumption has been made.

ASSUMPTION:

Assuming that a group of WITELs belonging to Medan and the other to Jakarta follows the above proportion, the shares within the respective groups (the WITELs I, II, and III as one group and the remaining as another for telephone, WITELs I and II as one group and the remaining as another for telex) will uniformly change in accordance with the change in share of each group.

The transitions of shares for total (incoming and outgoing) minutes broken down by WITELs, calculated in accordance with the foregoing ASSUMPTION, are shown in Appendix 4.8.2-1 for telephone and 4.8.2-7 for telex, respectively.

Appendix 4.8.2-8 also shows the result of calculation for the forecasted busy-hour Erlang (BHE) values broken down by WITEL for telex.

Table 3.5.1 International Telephone Traffic by Gateway

( ): percentage share

Year	Jakarta (thousand minutes)	Medan (thousand minutes)	Indonesia Total (thousand minutes)
1983	53,295	—	53,295
1984	62,320 (91%)	6,164 (9%)	68,484
1985	77,784 (90%)	8,643 (10%)	86,427
1986	94,611 (89%)	11,694 (11%)	106,305
1987	115,252 (88%)	15,716 (12%)	130,968
1988	139,579 (87%)	20,857 (13%)	160,436
1989	168,329 (86%)	27,402 (14%)	195,731
1990	199,645 (85%)	35,232 (15%)	234,877
1994	321,623 (83%)	65,875 (17%)	387,498
1999	499,313 (80.5%)	120,951 (19.5%)	620,264
2000	534,098 (80%)	133,525 (20%)	667,623

Table 3.5.2 International Telex Traffic by Gateway

( ): percentage share

Year	Jakarta (thousand minutes)	Medan (thousand minutes)	Indonesia Total (thousand minutes)
1983	23,747	—	23,747
1984	25,839 (93%)	1,945 (7%)	27,784
1985	29,906 (92%)	2,601 (8%)	32,507
1986	34,167 (91%)	3,379 (9%)	37,546
1987	38,691 (90%)	4,299 (10%)	42,990
1988	43,235 (89%)	5,344 (11%)	48,579
1989	47,879 (88%)	6,529 (12%)	54,408
1990	52,542 (87%)	7,851 (13%)	60,393
1994	65,563 (85%)	11,570 (15%)	77,133
1999	75,648 (82.5%)	16,046 (17.5%)	91,694
2000	76,885 (82%)	16,877 (18%)	93,762

3.6 International Telegram Demand Forecast

The total number of international telegram messages to and from Indonesia after 1981 has been forecasted using the following mathematical formula.

$$y = 31.43893088 + 1{,}106.818702 \times (0.8649144022)^{t}$$

y: Total international telegram messages to and from Indonesia

t = 0, 1, ... : 1975, 1976, ...

Year	83	84	85	86	87	88	89	90	94	99	2000
Messages (thousands)	378	331	291	256	225	199	177	157	102	65	61

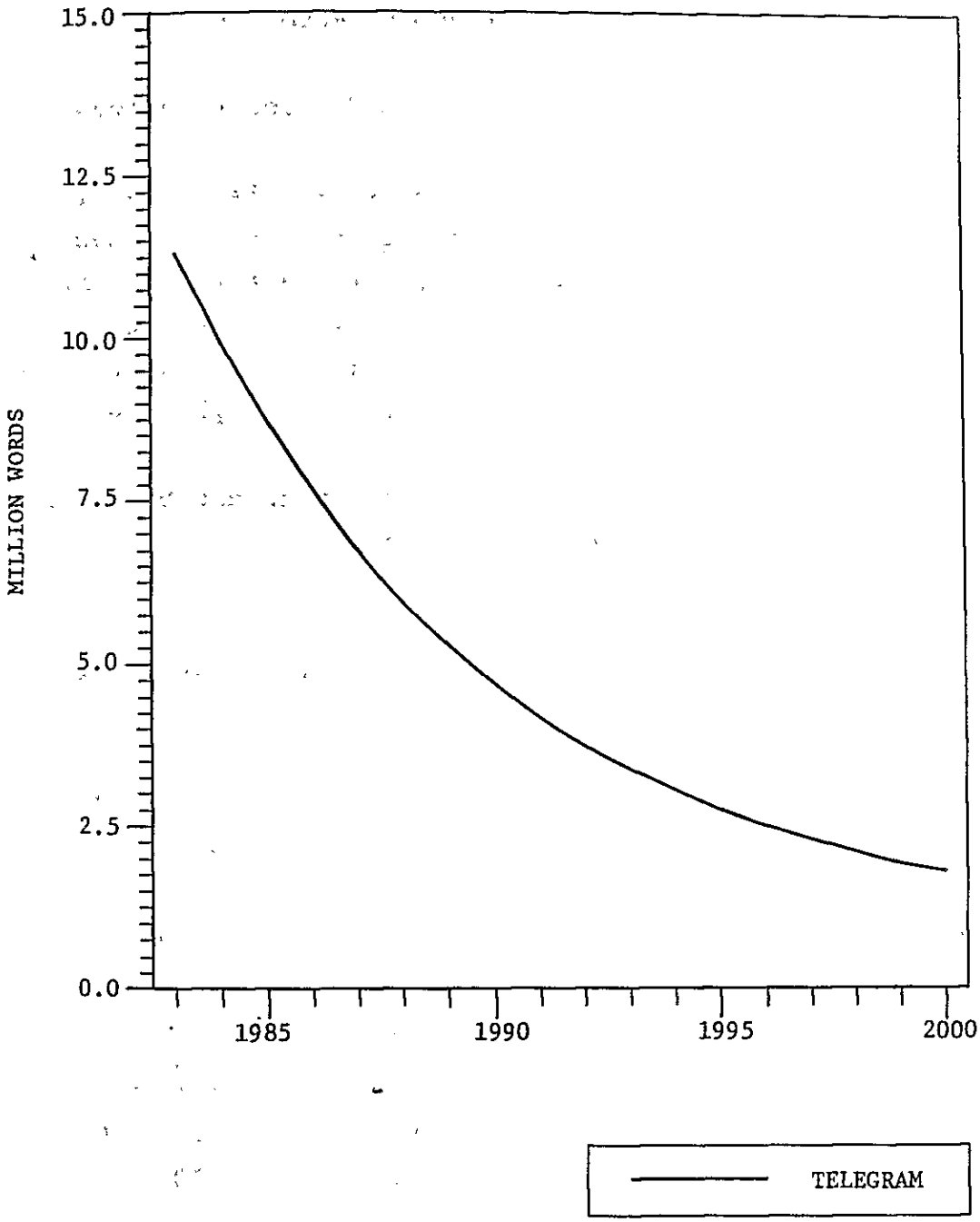


Figure 3.6 International Telegram

3.7 International Leased Circuit Demand Forecast

3.7.1 Forecast of Total Number of Leased Circuit by Type

Generally speaking, leased circuits are classified into two: telegraph-type and voice-grade. In this master plan, demand for the former is forecasted first and then the latter is obtained using the estimated ratio between these two classes, because the range of the annual data available for voice-grade circuits is rather short, while that for telegraph-type circuit is substantially long.

Demand for telegraph-type leased circuits has been forecasted by the following Gomperz curve formula:

$$Y = 183.9 * (0.364001)^{0.816247^t}$$

(Y: the number of telegraph type leased circuits
t = 1: 1978

As to the ratio between voice grade and telegraph type leased circuits, the former is expected to be approximately one third(1/3) of the latter by the year 1990 judging from the experience of KDD and other factors. The forecasted demand for this service is shown below:

Year	TG	VG/TG(%)	VG
1983	136	13	18
1984	144	16	23
1985	150	19	29
1986	156	22	34
1987	161	25	40
1988	165	28	46
1989	168	31	52
1990	171	34	58
1994	178	46	82
1999	182	61	111
2000	182	64	116

In the sales of leased circuits, prices take an important part in addition to other marketing variables such as quality of circuits, technical assistance, etc. Therefore, the above forecasts may fluctuate depending on how competitive pricing structure P.T. Indosat will introduce in line with an effective marketing strategy (See Appendix 3.6.1-1 for cost consideration from customer's point of view).

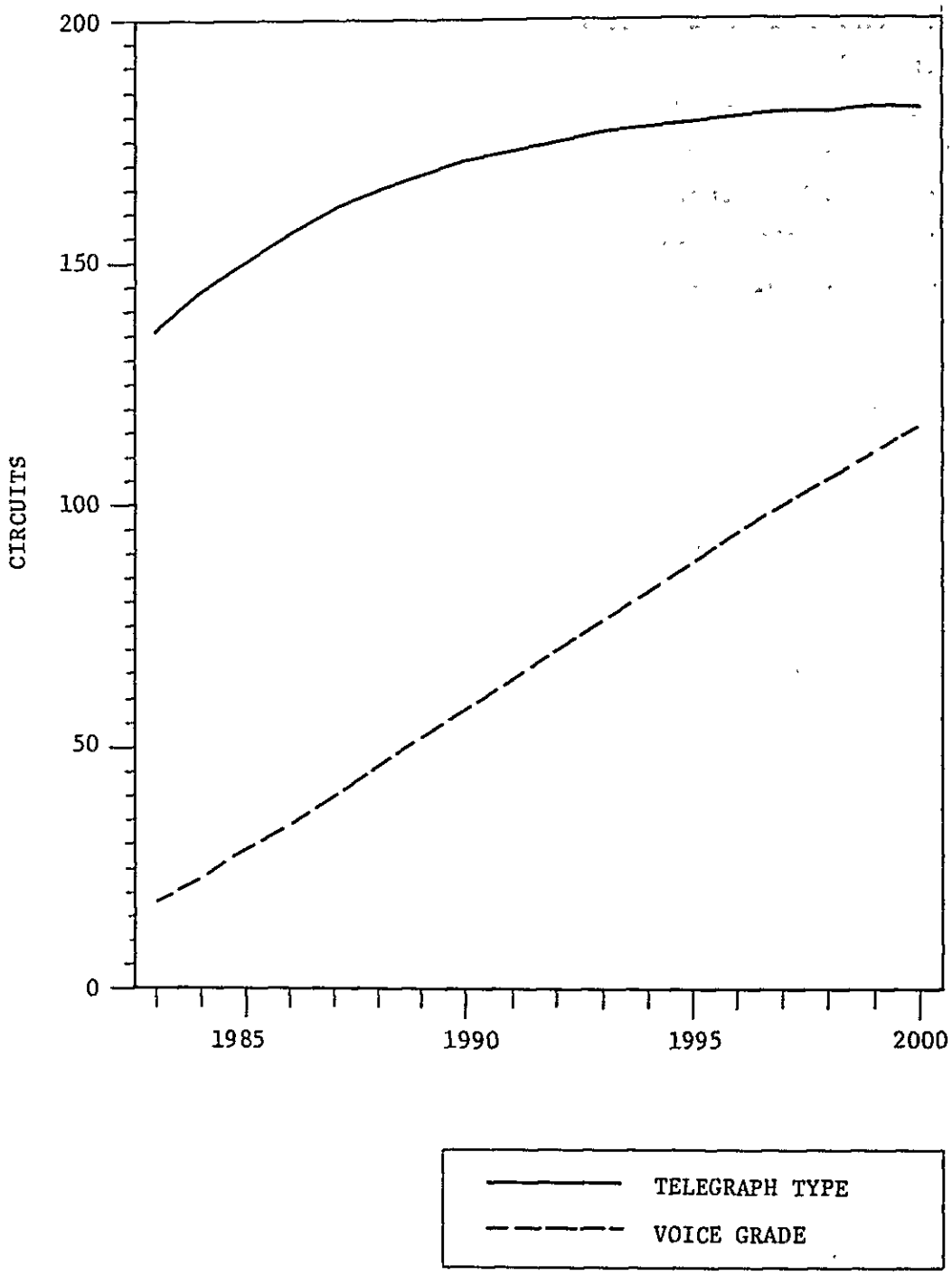


Figure 3.7 International Leased Circuits

3.7.2 Forecast of Telegraph-type Leased Circuits by Country

The distribution of the forecasted number of telegraph-type leased circuits on a country by country basis was made based on the following assumptions. (See Appendix 4.7.1-2.)

ASSUMPTIONS:

1. In addition to those countries with which Indonesia has telegraph-type leased circuits as of 1981, five countries high in telex utilization have been added to the destinations. This increases the number of countries requiring study to 21.
2. With the exception of Hong Kong and Singapore, the shares in 1989 of individual countries are assumed to be mathematical averages of the shares of telex and telegraph-type leased circuits in 1981 of that country.
3. The share of Hong Kong and Singapore in 1989 will be the remaining percentage.
4. The transition of the shares of individual countries in the 1984 through 1989 period and thereafter is expected to change arithmetically.

The foregoing assumptions are based on the premise that active marketing will be introduced. Originally, the telegraph-type leased circuit service strongly tended to have a competitive aspect among international telecommunication carriers. A few of international carriers have thus far been able to keep the bulk of user centers of leased-circuit networks under their domination. However, except for these limited exceptional destinations, a considerable correlation can be noted between share of each country of telex and that of telegraph-type leased circuits.

The degree of correlation is expected to be further strengthened when those circuits that stretch via these transit countries are included as direct circuits. Therefore, for the plan, shares of individual countries in telex messages, with the exception of special cases, have been used as a parameter.

A preferable forecast method would be to utilize information such as specific inquiries of customers brought about through marketing channels.

3.7.3 Forecast of Voice-grade Leased Circuits Broken Down by Country

The following assumptions were used in distributing the number of voice-grade leased circuits forecasted in 3.7.1 into country by country demands. (See Appendix 4.7.2-2)

ASSUMPTIONS:

1. In addition to those countries with which voice-grade circuits were maintained as of 1981, four countries high in the number of telegraph-grade circuits were added. This increased the number of countries to be studied to nine.
2. With the exception of Hong Kong and Singapore, voice-grade leased circuits in 1989 are expected to reach about 33% of the number of telegraph circuits with the neighboring countries and about 25% with distant countries. The difference between these totals and the forecasted value of total circuits for each year is estimated to be the number of circuits with Hong Kong and Singapore.
3. Numerals approaching the transition of the total number of voice-grade circuits have been selected whenever possible for the transition of voice-grade circuits requirements between 1981 and 1989.

3.8 Television Transmission Service Demand Forecast

The following linear fitting curve has been used to forecast total minutes in the television transmission service.

$$Y = -28{,}291 + 389.333 * YEAR$$

(Y: total TV transmission mission minutes
YEAR: the last two digits of the Christian era

The result is as follows:

Year	83	84	85	86	87	88	89	90	94	99	2000
Total minutes	4024	4413	4802	5192	5581	5970	6360	6749	8300	10253	10642

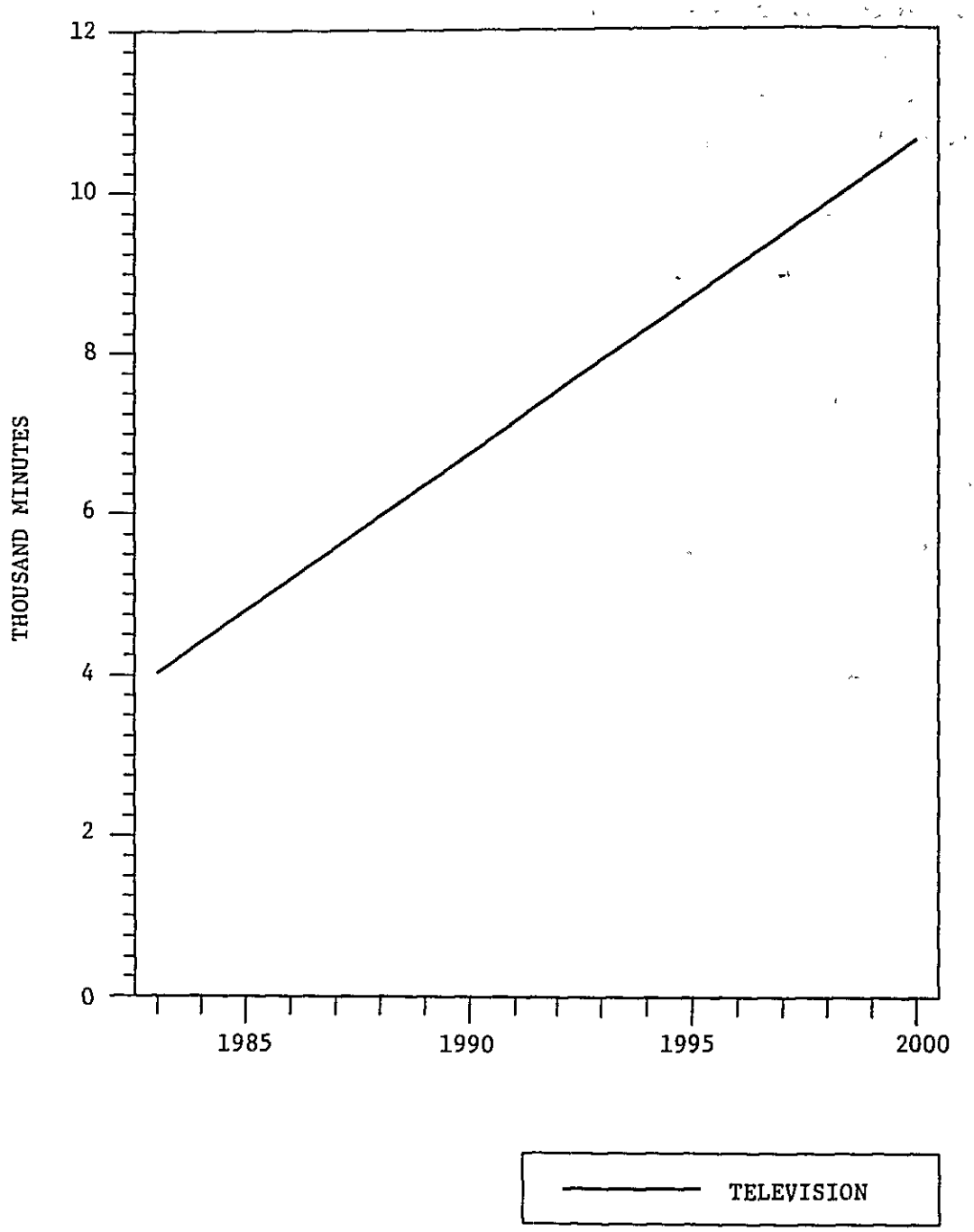


Figure 3.8 Television Transmission

3.9 Demand Forecasts for New Services

The forecasts in this section are mainly based on assumptions and analogies. After appropriate marketing researches are made, major figures should be replaced with more real data.

3.9.1 Maritime Satellite Communications

If P.T. Indosat determines to enter into the market of maritime satellite communications, their service offering during the initial period can be basically divided into two categories: communications service between Indonesian ocean-going ships and points in Indonesia, and that between foreign ocean-going ships and points in Indonesia. In the distant future, coastal ships of Indonesia may be utilizing this service. However, the forecast of this master plan does not include the lost categories. The handling of transit traffic is not considered, either. (See the diagram below.)

ASSUMPTIONS:

1. The ratio of Indonesian ocean-going ships to foreign ocean-going ships calling at Indonesian ports = 50:50 (analogized based on the loading ratio between Indonesian and Japanese ships of 50:50)
2. Of ocean-going ships, those over 5000 tons have been considered as ships that have potential demand to install a ship earth station (SES). Assuming Indonesian ships equipped with SES = foreign ships equipped with SES = 66 in 1984, an annual increase of 3.5% has been forecasted.
3. The proportion of ocean-going ships (5000 tons and over) installing a SES is estimated to change by a logistic curve that makes the initial service year to be t=1 of

$$\frac{100}{1 + 77.69187764 \times \exp(-0.821783t)}.$$

The initial year for foreign ships is set at 1979

and for Indonesia, 1984.
(The logistic curve adopted here has been chosen based on the data of Japanese ships with respect to the proportion of Japanese ships installing ship earth stations.)

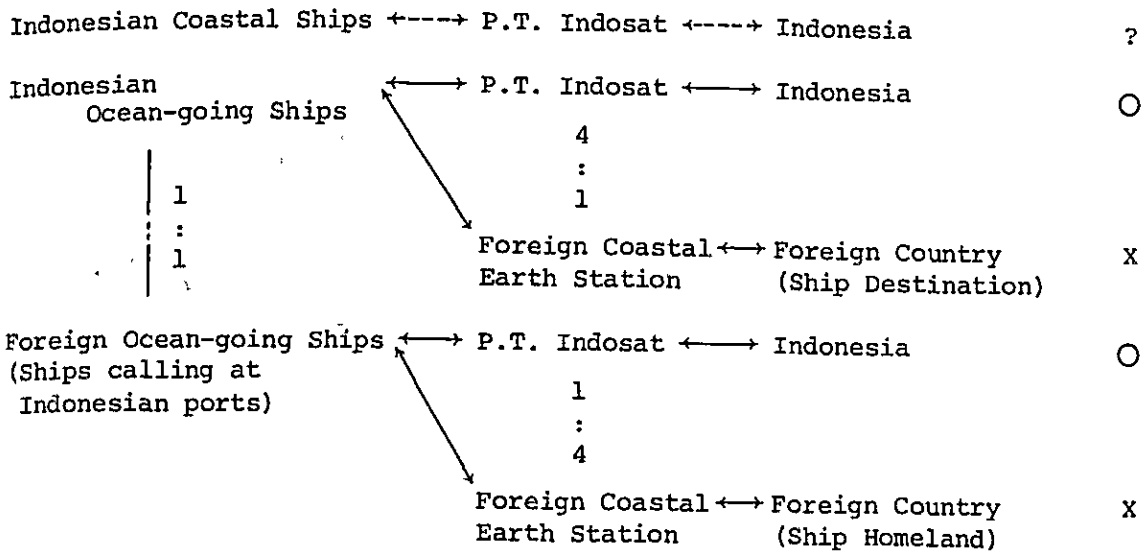
4. The ratio of traffic between ocean-going ships and their homeland to that between ocean-going ships and their destination countries = 4:1 (total for incoming and outgoing).
(Source: KDD data)

5. Average communication minutes per ship per year use the same basis for both Indonesian and foreign ships and are described in the following.
(Source: Data prepared by INMARSAT Secretariat)

Telephone:	4.74 minutes/ship/day x 330 days ≒ 1600 minutes/ship/year
Telex:	10.30 minutes/ship/day x 330 days ≒ 3400 minutes/ship/year

6. Telecommunications of foreign ocean-going ships with their homeland and of Indonesian ships with their destination countries are considered to be handled by overseas coastal earth stations of foreign countries because of land line charges.

7. It is assumed that no traffic would generate in the Atlantic Ocean and that P.T. Indosat's coastal earth stations would cover both the Pacific and Indian Oceans.



Note: O : handled by P.T. Indosat
X : not handled by P.T. Indosat

Forecast of Number of Ships to Install Ship Earth Stations (SES)

Year		1st	2nd	3rd	4th	5th	6th	7th
Indonesian ships	Ocean-going Ships	66	68	71	73	76	78	81
	Proportion of Installation (%)	3	6	13	26	44	64	80
	Number of Ships Installing SES	2	4	9	19	33	50	65
Foreign ships	Ships Calling at Indonesian Ports	66	68	71	73	76	78	81
	Proportion of Installation (%)	64	80	90	95	98	99	100
	Number of Ships Installing SES	42	54	64	69	74	77	81

Traffic Forecast

Telephone

Year	1st	2nd	3rd	4th	5th	6th	7th
Indonesian Ships	2	4	9	19	33	50	65
Average Minutes	1600	1600	1600	1600	1600	1600	1600
Traffic Proportion	0.8	0.8	0.8	0.8	0.8	0.8	0.8
① Traffic (x 1000 Min)	2.6	5.1	11.5	24.3	42.2	64.0	83.2
Foreign Ships	42	54	64	69	74	77	81
Average Minutes	1600	1600	1600	1600	1600	1600	1600
Traffic Proportion	0.2	0.2	0.2	0.2	0.2	0.2	0.2
② Traffic (x 1000 Min)	13.4	17.3	20.5	22.1	23.7	24.6	25.9
Total Demand (① + ②) (x 1000 Min)	16.0	22.4	32.0	46.4	65.9	88.6	109.1

Telex

Year	1st	2nd	3rd	4th	5th	6th	7th
Indonesian Ships	2	4	9	19	33	50	65
Average Minutes	3400	3400	3400	3400	3400	3400	3400
Traffic Proportion	0.8	0.8	0.8	0.8	0.8	0.8	0.8
①' Traffic (x 1000 Min)	5.4	10.9	24.5	51.7	89.8	136.0	176.8
Foreign Ships	42	54	64	69	74	77	81
Average Minutes	3400	3400	3400	3400	3400	3400	3400
Traffic Proportion	0.2	0.2	0.2	0.2	0.2	0.2	0.2
②' Traffic (x 1000 Min)	28.6	36.7	43.5	46.9	50.3	52.4	55.1
Total Demand (①' + ②') (x 1000 Min)	34.0	47.6	68.0	98.6	140.1	188.4	231.9

3.9.2 Bureau Facsimile

Much depends on how fast and how extensively service destinations will increase. However, the service has the potential of growing in the future as telecommunication media for small-scale users who do not have facsimile terminals. The following is a current forecast:

ASSUMPTIONS:

1. Assuming the number of messages per year as potential utilization is 5,000 messages in 1982, a growth of 20% a year has been forecasted.
2. The market is forecasted to increase following a logistic curve actualization ratio which sets the year 1982 at t=0.

$$\frac{100}{1 + 77.69187764 \times e^{-0.821783t}}$$

Forecasted Demand

Year	83	84	85	86	87	88	89	90
Potential Utilization (Messages)	5,000	6,000	7,200	8,640	10,368	12,442	14,930	17,916
Actualization Rate	4	11	23	42	64	81	91	96
Messages Forecasted for Utilization	550	1,380	3,024	5,530	8,398	11,322	14,333	17,558

3.9.3 Packet Switching Service

The following applications have been considered for estimating the demand for this service.

* database access
* real-time data transmission
* teletex
* data (G-IV) facsimile

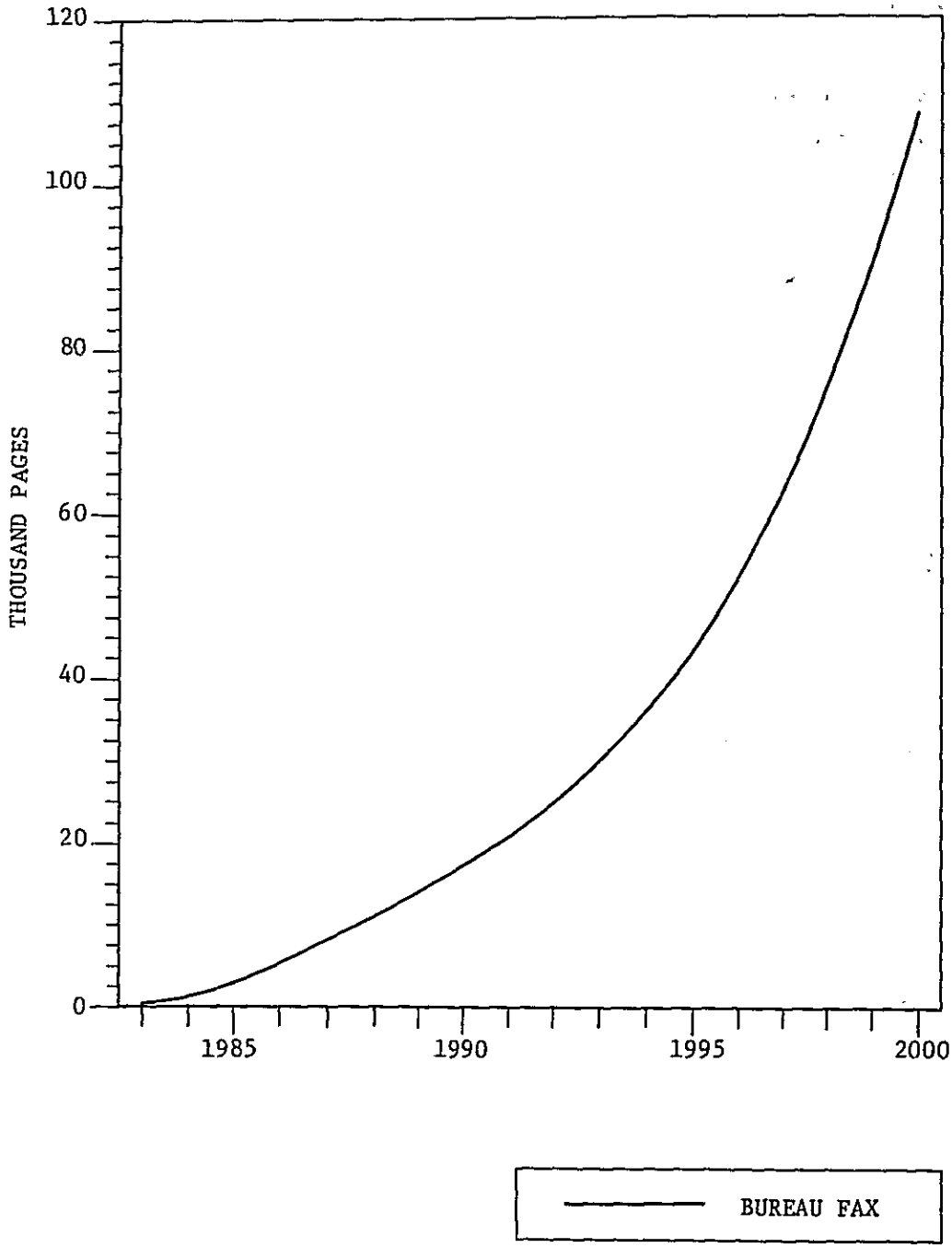


Figure 3.9.2 Bureau Facsimile

This service is assumed to be started in 1985. At the initial stage, the first two applications are accommodated under this service.

(1) Database Access

ASSUMPTIONS:

1. The initial number of potential subscribers is assumed to be 600. The growth rate is set at 20 percent per year.
2. The market is estimated to expand following a logistic curve actualization ratio that sets the initial year to be t=1.

$$\frac{100}{1 + 20.4305 * e^{-0.89665*t}}$$

3. Judging from KDD's current experience, the connection time per subscriber is estimated to be 2000 minutes per year, and 1 minute = 600 characters.
4. The fill factor of packets is set at 40 percent. Therefore, 1 character = (8/0.4)/(64*8) segments = 0.0390625 segments.

Forecasted Demand

Year	85	86	87	88	89	90	94	99	2000
Potential subscribers	600	720	864	1037	1244	1493	3096	7704	9244
Actualization ratio (%)	11	23	42	64	81	91	100	100	100
Number of subscribers	66	166	363	664	1008	1359	3096	7704	9244
Connection time per subscriber (10^3 minutes)	2	2	2	2	2	2	2	2	2
Connection time (10^3 minutes)	132	332	726	1328	2016	2718	6192	15408	18488
Traffic (10^6 characters)	79.2	199.2	435.6	796.8	1209.6	1630.8	3715.2	9244.8	11092.8
Traffic (10^6 segments)	3.09	7.78	17.02	31.13	47.25	63.70	145.13	361.13	433.31

(2) Real Time Data Transmission

ASSUMPTIONS:

1. This application includes time sharing service and various kinds of file transfer.
2. The initial number of potential subscribers is assumed to be 18. The growth rate is set at 20 percent per year.
3. The same ratio as that for database access has been used in estimating demand actualization ratio:

$$\frac{100}{1 + 20.4305 * e^{-0.89665*t}}$$

4. The traffic per subscriber for the first year is estimated to be 220 kilo-segments based on the current KDD experience. Increase of 10 percent per year has been forecasted.
5. Segments/minutes ratio is assumed to be 421.9

$$(= \frac{4800 \times 60}{64 \times 8} \times 0.75)$$

(1 segment = 64 octet = 64 x 8 bits = 512 bits)

Forecasted Demand

Year	85	86	87	88	89	90	94	99	2000
Potential subscribers	18	22	26	31	37	45	93	231	277
Actualization ratio (%)	11	23	42	64	81	91	100	100	100
Number of subscribers	2	5	11	20	30	41	93	231	277
Segments per subscriber (10^3 segments)	220	242	266	293	322	354	519	835	919
Traffic (10^6 segments)	0.44	1.21	2.93	5.86	9.66	14.51	48.27	192.89	254.56
Connection time (10^3 minutes)	1.04	2.87	6.94	13.89	22.90	34.39	114.41	457.19	603.37

(3) Teletex

ASSUMPTIONS:

1. Start year is assumed to be 1986.
2. Traffic per call is set at 1,200 characters (= 9.6 kilo-bits) (At present telex average minutes per call is approximately 3 minutes. And, 400 characters/minute x 3 minutes = 1,200 characters. Teletex is assumed to have a similar characteristic.)
3. The traffic for the start year is assumed to be 25,000 calls. (50 subscribers x 500 calls/year/subscribers = 25,000 calls/year. The first two figures are derived from the assumption that approximately 1 percent of the current telex subscribers will switch from telex to teletex in the first year.)
4. The traffic growth for the first 4 years is set at 35 percent per annum, and that for the remaining years at 25 percent.
5. Segments/minutes ratio is assumed to be 210.9 $(= \frac{2400 \times 60}{64 \times 8} \times 0.75)$

Forecasted Demand

Year	86	87	88	89	90	94	99	2000
Traffic (10^3 calls)	25	34	46	62	83	203	619	773
Traffic (10^6 characters)	30	41	55	74	100	244	743	928
Traffic (10^6 segments)	0.47	0.64	0.86	1.16	1.56	3.81	11.61	14.50
Connection time (10^3 minutes)	2.23	3.03	4.08	5.50	7.40	18.07	55.05	68.75

(4) Data (G-IV) Facsimile

ASSUMPTIONS:

1. Start year is assumed to be 1986.
2. The number of equipment for the start year is assumed to be 6. The growth rate for the first 4 years is set at 50 percent per annum, and that for the remaining years at 25 percent per annum.
3. Traffic per equipment is assumed to be 25 pages per day. By the state-of-the-art technology, information on one page can be expressed by approximately 400 kilo-bits with compression rate of 10 percent.
4. Segments/minutes ratio is set at 2,109
   $(= \frac{24{,}000 \times 60}{64 \times 8} \times 0.75)$

Forecasted Demand

Year	86	87	88	89	90	94	99	2000
Number of equipment	6	9	14	20	30	74	226	283
Traffic (10^6 segments)	29.30	43.95	68.36	97.66	146.48	361.33	1103.52	1381.84
Connection time (10^3 minutes)	13.89	20.84	32.41	46.31	69.45	171.33	523.24	655.21

(5) Total Connection Time and Traffic

Year		85	86	87	88	89	90	94	99	2000
Connection time (10^3 minutes)	Database access	132	332	726	1328	2016	2718	6192	15408	18488
	Real time data	1	3	7	14	23	34	114	457	603
	Teletex	-	2	3	4	6	7	18	55	69
	Data fax	-	14	21	32	46	69	171	523	655
	Total	133	337	757	1378	2091	2828	6495	16443	19815
Traffic (10^6 segments)	Database access	3	8	17	31	47	64	145	361	433
	Real time data	1	1	3	6	10	15	48	193	255
	Teletex	-	1	1	1	1	2	4	12	15
	Data fax	-	29	44	68	98	146	361	1104	1382
	Total	4	39	64	106	156	227	558	1670	2085

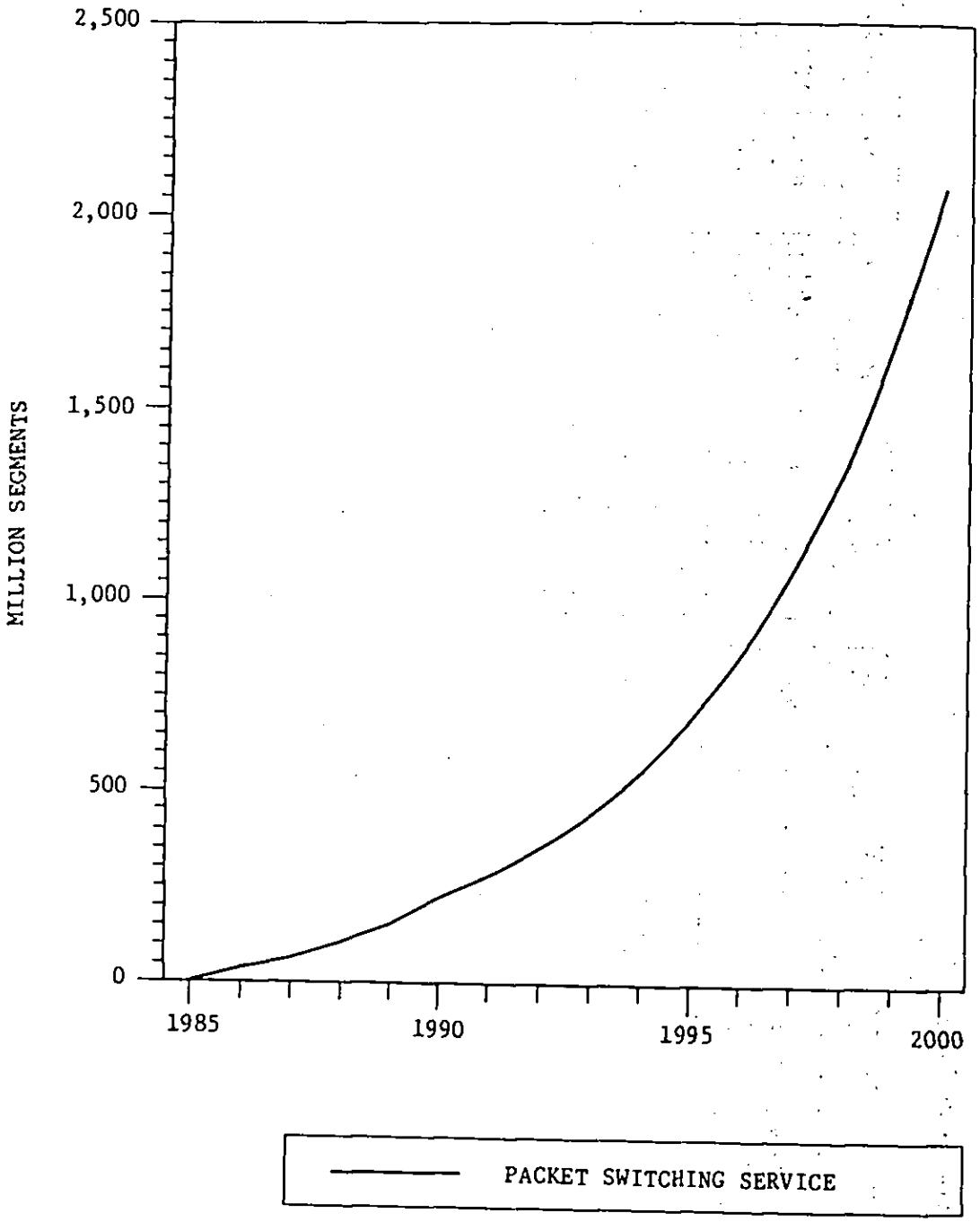


Figure 3.9.3 Packet Switching Service