

II-4-1 Outline

The number of subscribers to cellular phone services is steadily rising, as well as demand for data communications.

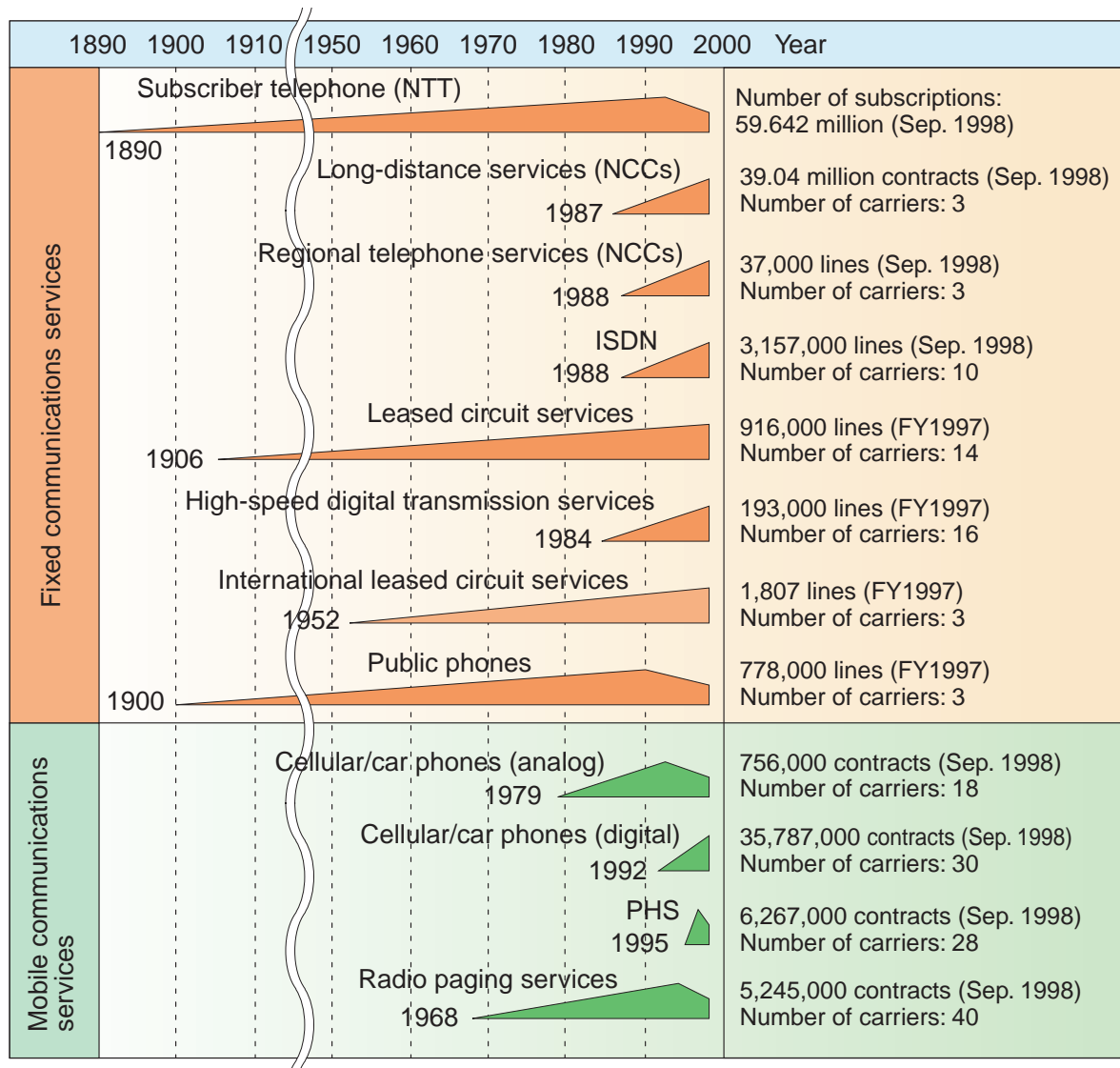
Regarding the current status of major telecommunications services (Refer to Appendix 16), both the number of NTT's subscribers to subscriber telephone lines and the number of public pay telephones have decreased for the past two years, partly due to a rapid increase in the number of cellular phone subscribers. However, the numbers of subscribers for both long-distance and regional telephone services provided by new common carriers (NCCs) have been increasing, thereby leading to enhanced competition in the market.

The number of ISDN lines providing high-speed

transmission of a large amount of data has been growing almost at an exponential rate, due to the expansion of Internet use. In the leased circuit business, demand has been also shifting to lines with larger capacity.

In mobile communications services, the number of cellular phone subscribers has significantly expanded and there has been a steady shift from the analog system to the digital system since last year. Meanwhile, the number of PHS subscribers has decreased slightly, while the number of subscribers to radio paging services has dropped significantly.

Fig. Outlines of major telecommunications services



Note: Figures are as of the end of each fiscal year. Months indicate as of the end of each month.

II-4-2 Usage of various communications media

(1) Communications among different phone systems

Only calls between subscriber telephones have decreased.

Regarding communications between subscriber telephone, cellular / car phone and PHS (excluding a call from ISDN), the calls between two subscriber telephones occupied 73.2% of total amount of communications, a drop of 8.8 percentage points from the previous fiscal year.

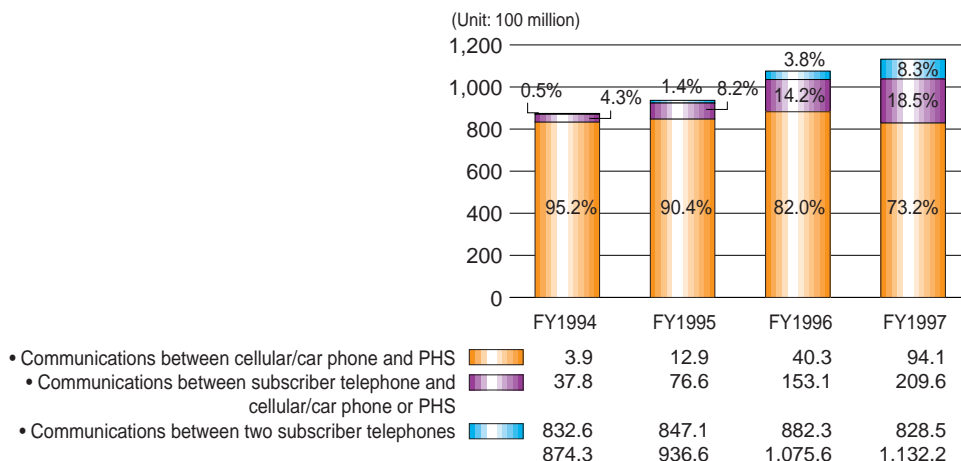
In contrast, communications between subscriber telephones and either a cellular, car or PHS telephone represented 18.5% of the total, up 4.3 percentage points from the year before. In addition, communications between cellular or car phones and PHS terminals occupied 8.3% of calls, up 4.5 percentage points from the previous fiscal year (Fig. 1).

Subscribers to subscriber telephone lines tended

to receive more calls than they made, whereas among users of cellular, car or PHS terminals, the number of outgoing calls was higher than the number of incoming calls.

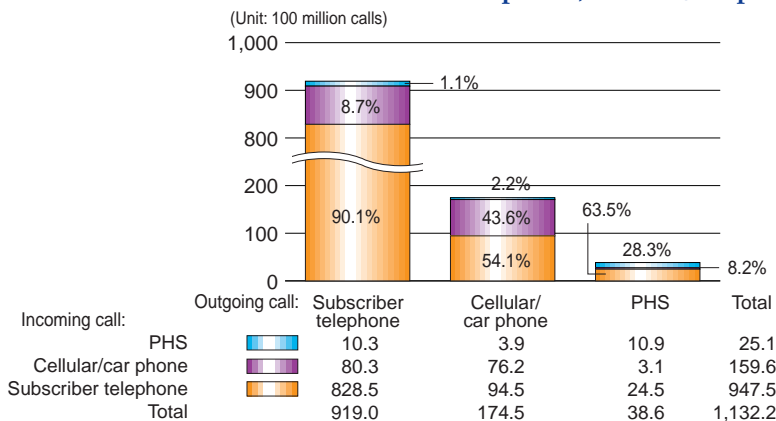
In fiscal 1997, the destination of most calls from any type of telecommunications device was a subscriber telephone. In addition, as much as 97.8% of the calls from cellular or car phones went to either another phone of the same type or to a subscriber telephone, while 91.7% of calls from PHS sets were made to either another PHS terminal or to a subscriber telephone. These figures confirm that calls between cellular or car phone and PHS terminal are fewer than calls involving subscriber telephone lines (Fig. 2).

Fig. 1 Trends of communications among different phone systems



Notes: 1. Number of calls for subscriber telephone includes incoming calls for ISDN.
2. Calls from a cellular/car phone to a PHS are included in the fiscal 1996 figure for calls from cellular/car phone to a subscriber telephone because of a reason regarding their systems.

Fig. 2 Trends in call destinations from subscriber telephone, cellular/car phone and PHS



Notes: 1. Number of incoming calls for subscriber telephone includes incoming calls for ISDN.
2. Calls from a cellular/car phone to a PHS are included in the figure for calls from cellular/car phone to a subscriber telephone due to certain features in their systems.

Source: MPT

(2) Total duration and number of telephone calls by service type

Both the duration and number of outgoing calls via ISDN's rose significantly.

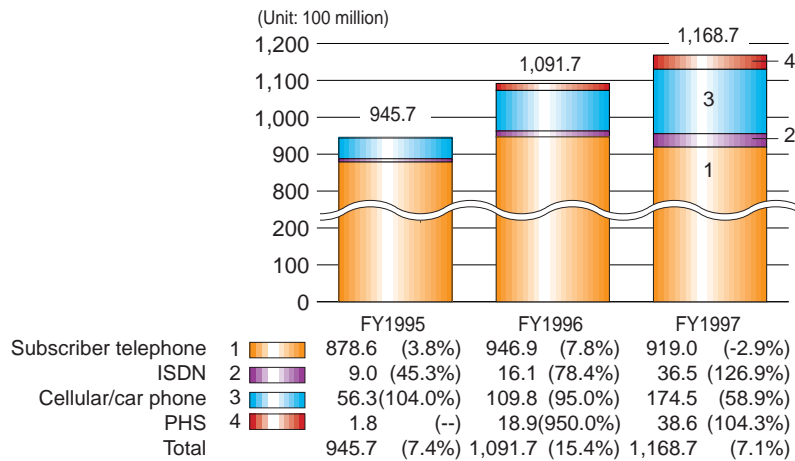
In fiscal 1997, a total of 116.9 billion telephone calls were made in Japan, a rise of 7.1% from the previous fiscal year. Among these, outgoing calls from subscriber telephones came to 91.90 billion, down 2.9% from the previous fiscal year. In contrast, usage of the other types of service surged. Outgoing calls from cellular or car phones amounted to 17.45 billion, up 58.9% from the previous fiscal year; calls from PHS sets came to 3.86 billion, up 104.3%, and outgoing calls made via ISDN lines rose a staggering 126.9% to reach 3.65

billion.

The total duration of all telephone calls was 4.72 billion hours, up 6.1% from the previous fiscal year. For subscriber telephones, the total duration was 4.02 billion hours, down 1.2%, but the duration of calls via cellular or car phones rose 72.1% to reach 460 million hours; calls from PHS sets lasted a total of 110 million hours, up 112.0%, and the total duration of calls via ISDN lines rose 123.2% to 130 million hours.

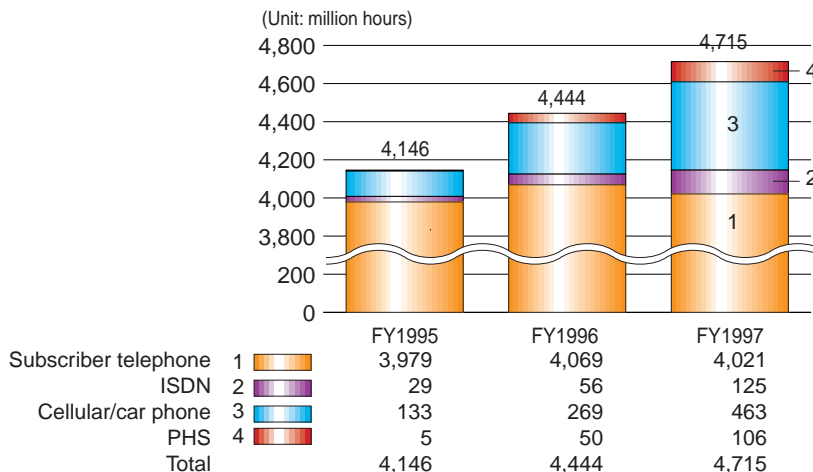
II-4

Fig. 1. Trends in number of outgoing calls by service type



Notes: 1. Figures in parentheses indicate growth rates compared with the previous fiscal year.
2. Number of calls for ISDN includes that of only conversation mode.

Fig. 2. Trends in call duration by service type



Note: Number of calls for ISDN includes that of only conversation mode.

Source: MPT

(3) Telephone usage at different times of day, and duration of individual calls

Usage of subscriber lines dips at midday, while usage of mobile phones steadily rises to an evening peak.

II-4

1. Trends in usage at different times of day

Followings are the status of communications of subscriber telephone, cellular / car phone and PHS by times zone in fiscal 1997.

i) Number of subscriber telephone calls at various times of day (Fig. 1)

In the case of subscriber NTT lines, nearly 60% of calls were made from phones at business premises, showing how trends in business use greatly influenced overall figures. More precisely, the number of calls using phones on business premises showed rises between 9 a.m. and noon (during typi-

cal morning office hours), between 1 p.m. and 2 p.m. (immediately after the usual lunch hour), and between 4 p.m. and 5 p.m. (the hour before many offices close to the public). On the other hand, the number of calls made by telephones at home is higher after 6 p.m. in the evening, reaching its peak between 8 p.m. and 9 p.m.

No such difference between business and domestic usage was seen in the case of calls from subscriber telephones via NCCs -- comprising DDI, JT, TTNNet and Teleway (now part of KDD). However, the curve in the usage rate for all calls was similar

Fig. 1 Number of calls by subscriber telephone at various times of day

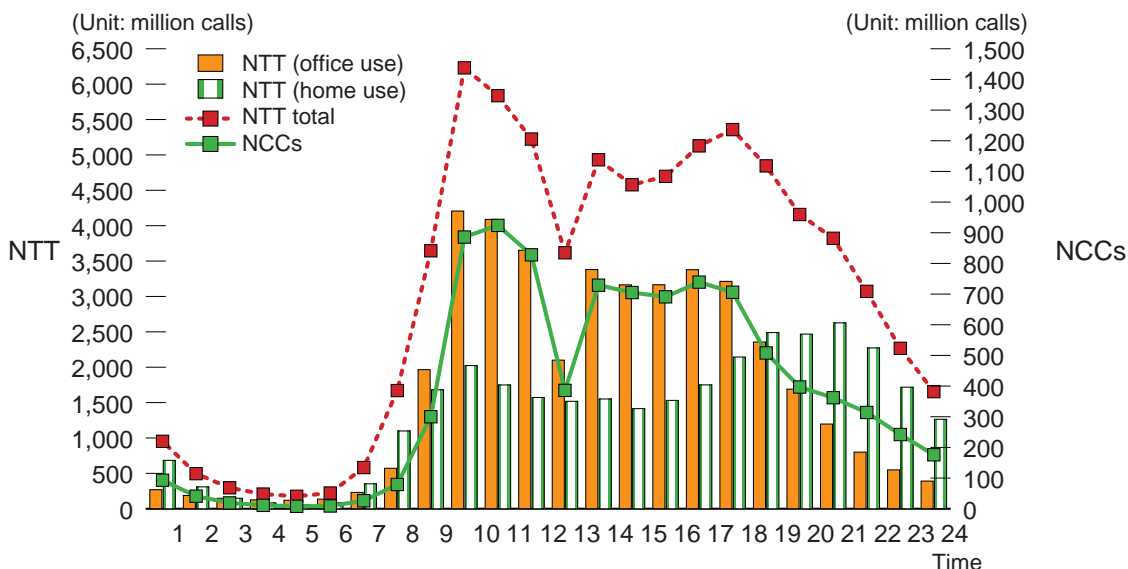
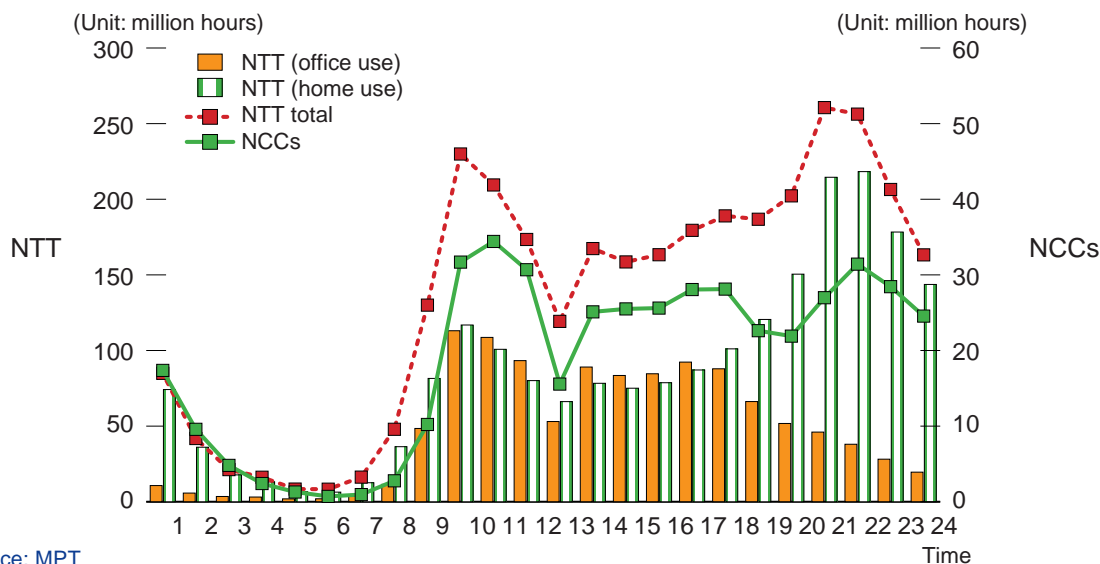


Fig. 2 Total duration of calls by subscriber telephone at various times of day



Source: MPT

Telecommunications service

to that of NTT lines used at business premises.

ii) Duration of calls by subscriber telephone at various times of day (Fig. 2)

Although a higher number of calls was made from business premises in the case of NTT subscriber lines, the figures were reversed regarding duration of calls. More than 60% of the total duration was occupied by use of telephones at home, indicating how this is the major factor in determining overall duration figures. The duration of calls from home telephones was particularly long in the evening, reaching a peak between 8 p.m. and 10 p.m.

iii) Number of calls by mobile telephone at various times of day (Fig. 3)

Regarding calls by cellular or car phones, or by PHS, the tendency for the number to increase between 7 a.m. and 10 a.m. was similar to that of subscriber telephone calls. However, the number of calls by mobile phone did not drop significantly between noon and 1 p.m., and it reached a peak between 5 p.m. and 7 p.m. The number of calls by

cellular or car phone fell drastically after 7 p.m., while the number of calls by PHS went down gradually after 11 p.m.

iv) Duration of calls by mobile phone at various times of day (Fig. 4)

The duration of calls made by cellular or car phones, or PHS, rose throughout the day after 7 a.m. For PHS, there was a sudden rise after 8 p.m. to a peak between 11 p.m. and midnight. The trend indicates that the majority of PHS users are individual users.

2. Trends in number of calls by call duration (Fig. 5)

For subscriber telephone lines and cellular or car phones, calls lasting between 10 and 20 seconds were the most common. For PHS, however, calls lasting less than 10 seconds were most common, and more than 40% of the PHS calls lasted less than 20 seconds. This indicates the trend for many PHS subscribers to use their terminals for text messages.

Fig. 3 Number of calls by mobile telephone at various times of day

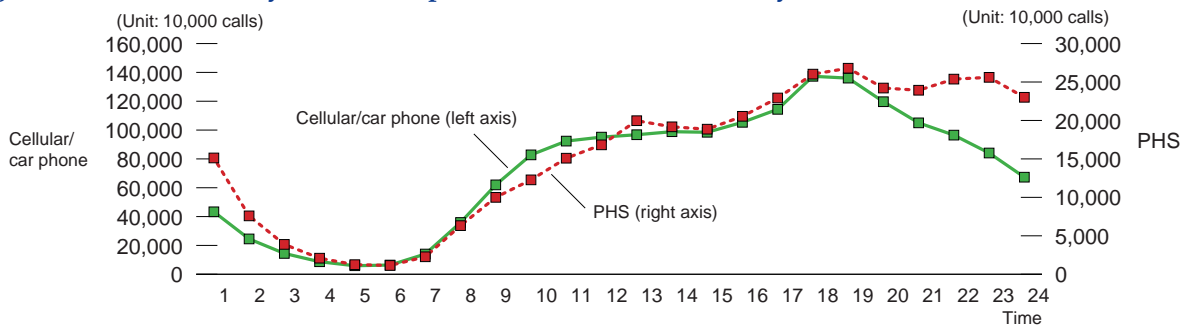


Fig. 4 Total duration of calls by mobile telephone at various times of day

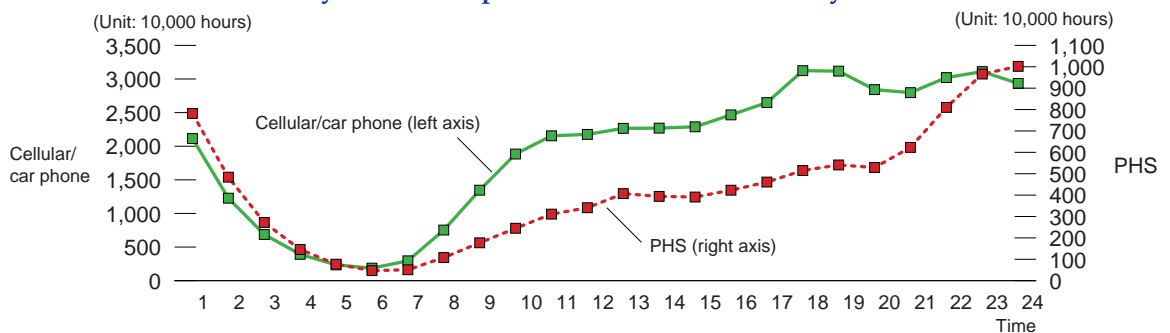
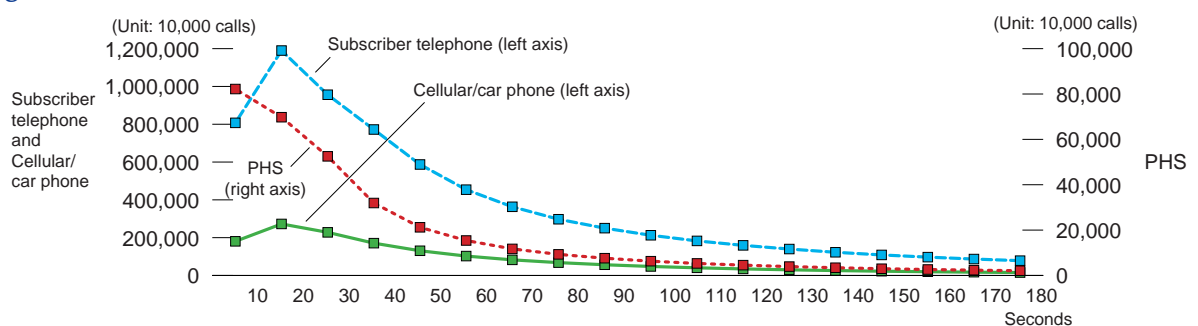


Fig. 5 Trends in the duration of individual calls



Source: MPT

(4) Telephone usage by local service area

Compared with subscriber telephones, cellular/car phones and PHS are mainly used in the local service areas whose communications charges are comparably low.

II-4

Followings are the status of calls for subscriber telephone, cellular/car phone and PHS by local service area in fiscal 1997.

1. Subscriber telephone

In fiscal 1997, as many as 59.5% of all calls between two subscriber telephones were made within a local service area covered by the same local switch, however, this percentage has been declining. The percentage of calls to an adjacent local service area has been leveling off (Fig. 1; Refer to Appendix 17).

2. Cellular/car phone

As regards traffic via cellular or car phones, most

calls -- as well as the largest total duration of calls -- were made either within the same local service area or to an adjacent one (Fig. 2). The average duration of these calls was 1 minute 23 seconds, while calls to more distant places averaged 2 minutes and 41 seconds, despite the higher charges for long-distance calls (Table 1).

3. PHS

About 78% of calls made by PHS, or about 75% of their total duration, were made within the same local service area or to an adjacent one (Fig. 3). Following the same pattern as cellular and car phones, the average call duration tended to be longer for long-distance calls (Table 2).

Fig. 1 Number of calls by local service area (national average)

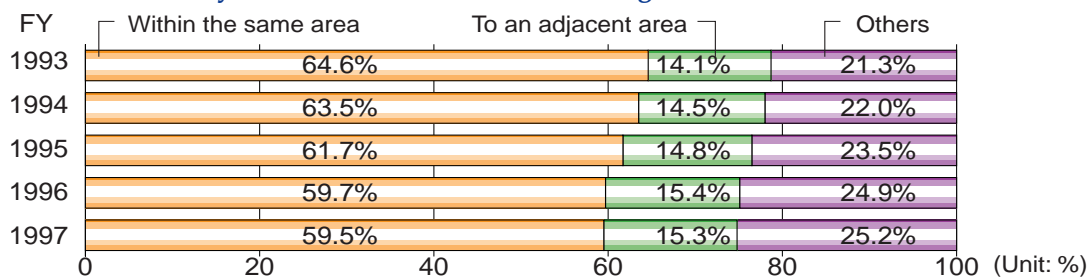
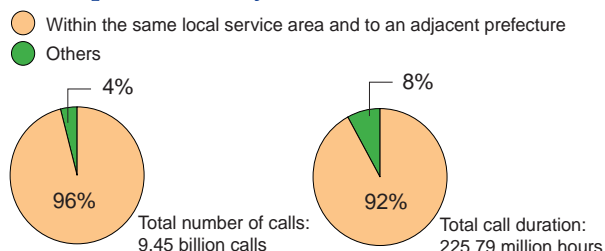


Fig. 2 Number and duration of cellular/car-phone calls by local service area



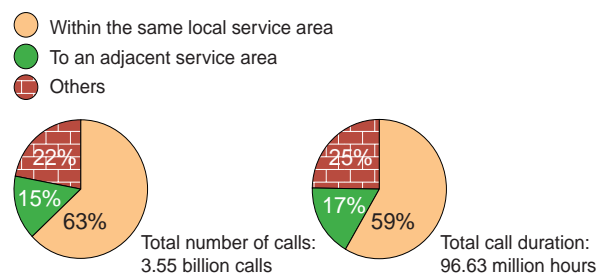
Note: Data were based on the figure of calls from cellular/car phones to subscriber telephones.

Table 1 Individual cellular/car-phone calls by local service area

	Number of calls per day	Total call duration per day	Average call duration per call
Within the same service area and to an adjacent prefecture	0.95 calls	1 min. 18 sec.	1 min. 23 sec.
Others	0.04 calls	7 sec.	2 min. 41 sec.

Note: This table was based on the data of calls from cellular/car phones to subscriber telephones.

Fig. 3 Number and duration of PHS calls by local service area



Note: Fig. 3 was based on the data of calls from PHS to either subscriber telephone or PHS.

Source: MPT

Table 2 Individual PHS calls by local service area

	Number of calls per day	Total call duration per day	Average call duration per call
Within the same local service area	0.96 calls	1 min. 28 sec.	1 min. 31 sec.
To an adjacent local service area	0.23 calls	25 sec.	1 min. 49 sec.
Others	0.33 calls	37 sec.	1 min. 52 sec.

Note: This table was based on the data of calls from PHS to either subscriber line telephone or PHS.

II-4-3 Subscriber telephones

As in fiscal 1996, the number of subscribers to NTT subscriber lines fell in fiscal 1997.

The number of subscribers to NTT's subscriber telephones was 59.64 million at the end of September 1998, a fall of 2.6% from one year before and the second annual drop in a row. Business subscribers numbered 17.48 million, down 6.5% from September 1997, and home-use subscribers numbered 42.16 million, down 0.9% (Fig. 1).

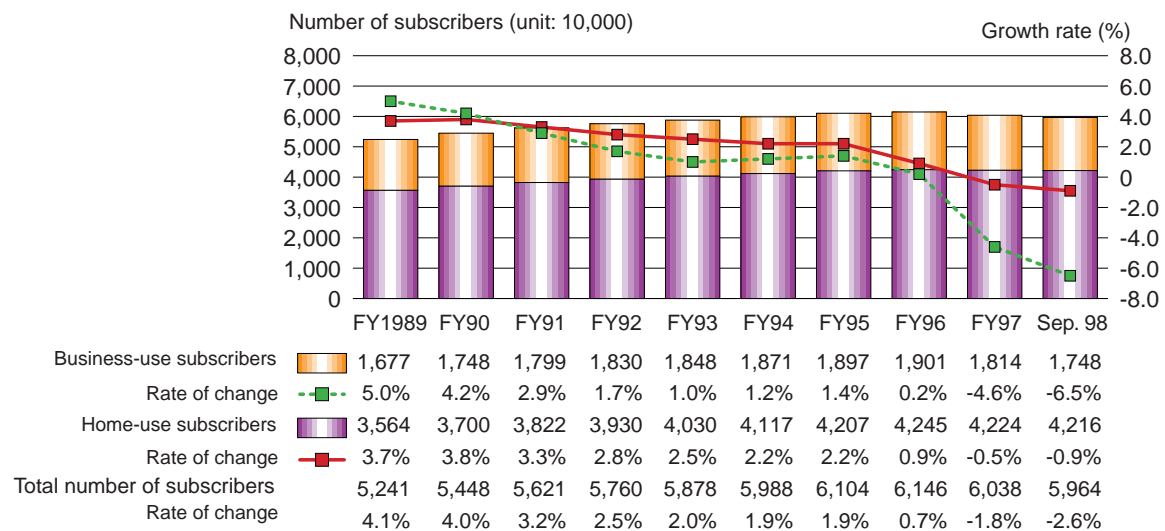
As regards new common carriers (NCCs) offering long-distance services, that is DDI, JT and Teleway (now part of KDD), their total number of

subscribers at the end of September 1998 was 39.04 million, up 6.1% from the previous year. Meanwhile, the total number of subscribers to regional NCCs (TTNet, TITUS Communications and J-COM Tokyo Corp., Ltd.) was 37,000 at the end of September 1998 (Fig. 2).

In contrast to the decline in NTT subscribers, NCCs are seeing numbers rise. While the number of calls by NTT's subscriber telephones decreased by 7.8%, those via NCCs increased by 10.1%, the

II-4

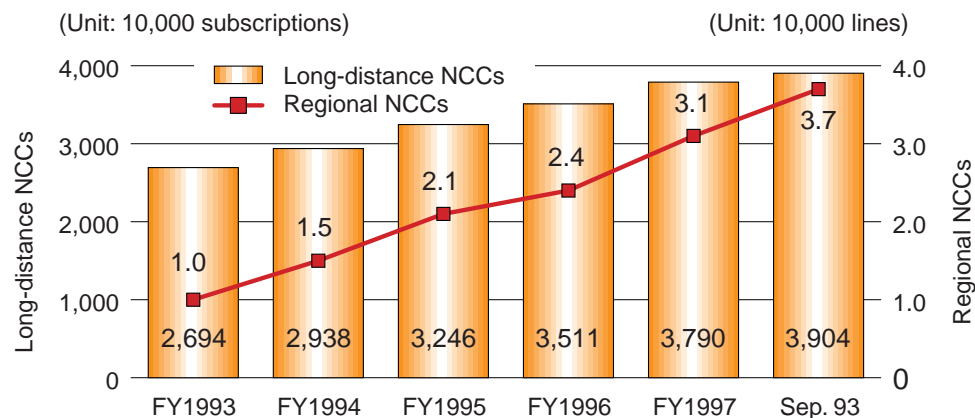
Fig. 1 Trends in number of subscribers and the increasing rate for NTT subscriber telephones



Note: Numbers of business-use subscribers include users of centralized exchange systems.

Source: NTT

Fig. 2 Rise in number of subscribers to long-distance and regional NCCs



Sources: Relevant carriers

NCCs' share of the total number of calls was 11.1%, increasing by 1.6 percentage points from the previous fiscal year (Fig. 3).

NTT and NCCs mainly compete in the long-distance market for calls between prefectures, with NCC business steadily expanding. NCCs held 40.6% of that market at the end of fiscal 1997, up 4.9 percentage points from the previous fiscal year. The market share of NCCs was particularly strong in communications among Tokyo, Osaka and Aichi

Prefectures, reaching 59.6% at the end of fiscal 1997, up 3.2 percentage points from the previous fiscal year (Figs. 4 and 5).

In October 1997, TNet launched a relay telephone service, "Tokyo Denwa." During the first year of the new service, the carrier won 1.51 million subscribers, a significantly large number. In addition, KDD entered the domestic market in July 1998 following the abolition of the KDD Law.

Fig. 3 Trends in market share of NTT and NCCs (total number of calls)

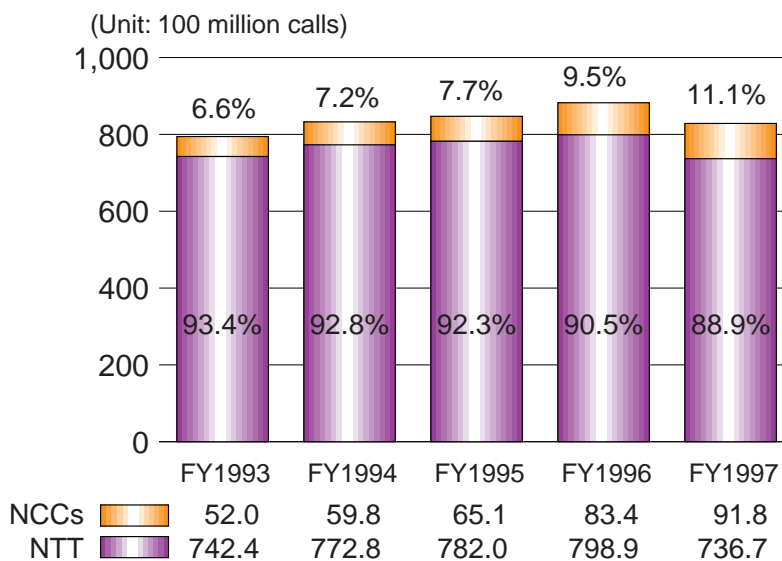


Fig. 4 Trends in market share of NTT and NCCs (total long-distance calls)

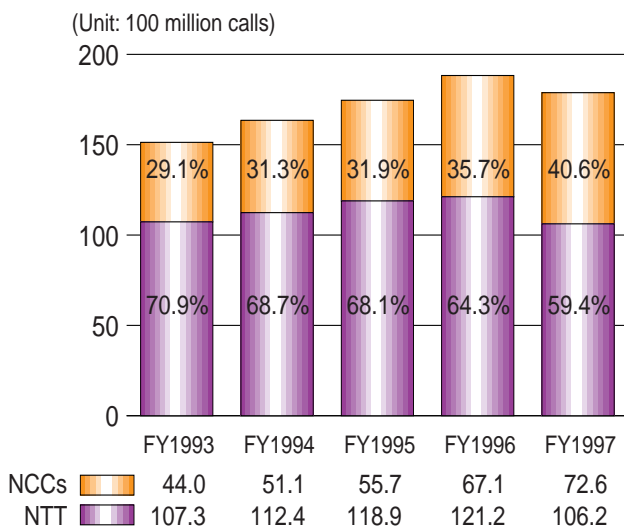
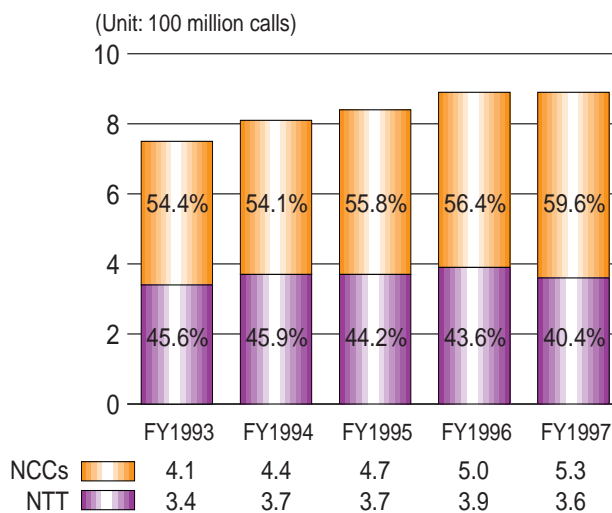


Fig. 5 Trends in market share of NTT and NCCs (total calls between Tokyo, Osaka and Aichi Prefectures)



Source: MPT

II-4-4 ISDN

With the rise in Internet usage in Japan, ISDN lines and traffic on them are increasing rapidly.

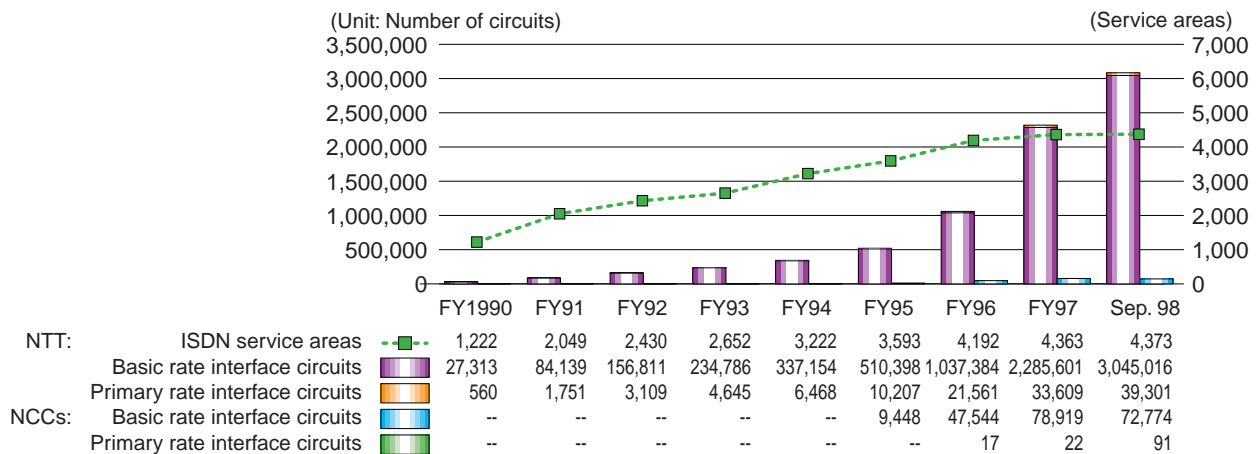
There are two ISDN services available in Japan. One type is provided through basic rate interface circuits that enable use of up to two channels with 64-kbps data transmission rates, while the other type of service is provided through primary rate interface circuits that use 1.5-Mbps high-speed, large-capacity data transmission.

As of the end of September 1998, a total of 3.11 million lines (up 83.3% from a year before) of the former service were in operation and a total of 39 thousand lines (up 40.7%) of the latter service. Both have achieved rapid expansion since fiscal 1995

(Fig. 1). Total traffic via ISDN lines has also been increasing in recent years, with a significant rise, especially in data transmissions, in fiscal 1997 (Fig. 2).

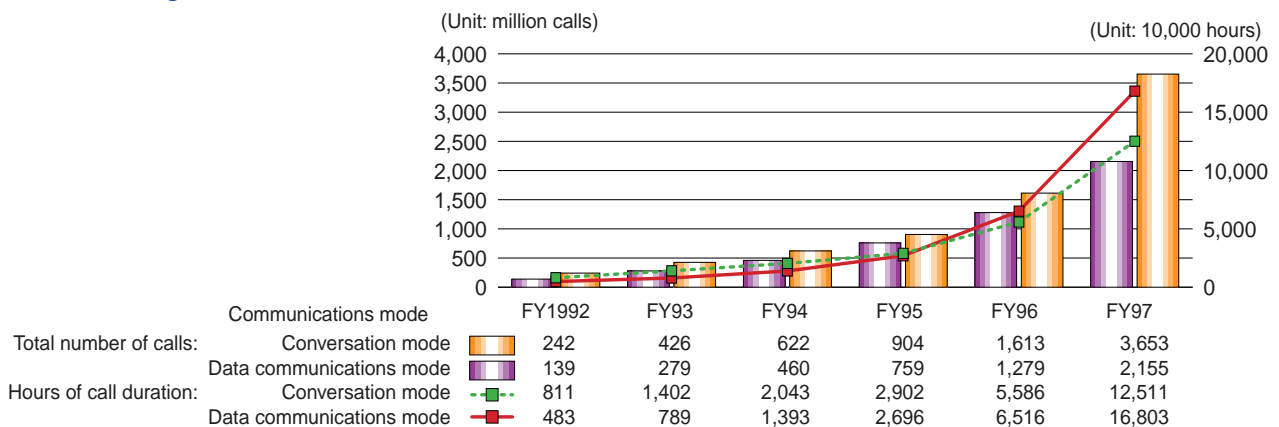
There are several reasons for these trends. Since ISDN can transmit a much bigger amount of data at a higher speed than conventional telephone lines, it is highly suited to the Internet and computer communications. Furthermore, ISDN lines allow the simultaneous use of telephones and Internet access, and the initial cost of installing ISDN equipment, such as terminal adapters, has been falling recently.

Fig. 1 Trends in ISDN lines and number of areas where ISDN services are available



Source: Related carriers.

Fig. 2 Trends in traffic of ISDN



Notes: 1. Both the number of calls and the hours of call duration (both conversation and data communications modes) indicate the total of 64-kbps and 1.5-Mbps services.

2. The conversation mode is used when voice is transmitted, and the communications mode is used when data is transmitted.

Source: NTT

II-4-5 Public phones

The number of public phones has been decreasing year by year.

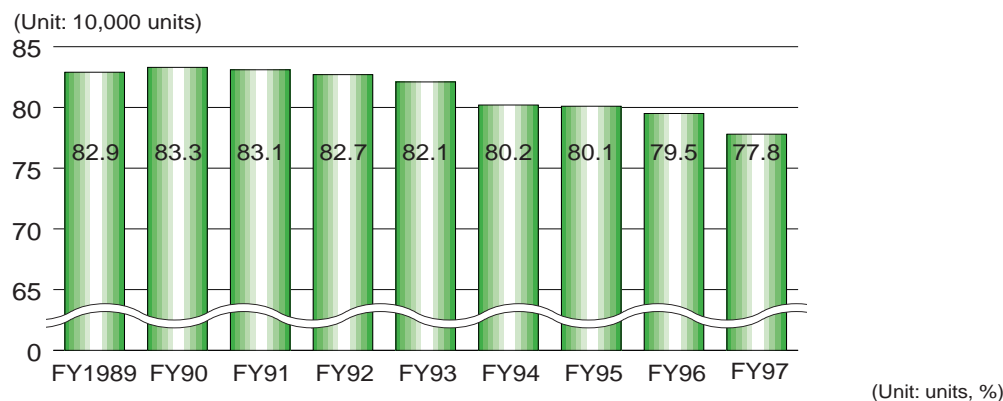
II-4

The total number of public telephones in Japan was 778,470 at the end of fiscal 1997, down 2.1% from the previous fiscal year. The number fell for seven consecutive years from fiscal 1991, partly because of the expansion in the number of subscribers to cellular/car phone services. However, with the rise in the outdoor use of computers with a mobile communications function, there has been an

increase in the number of public phones that can handle digital communications (Fig.).

In addition, a new type of public telephone as introduced in March 1999 that accepts telephone cards containing IC chips which give access to a variety of information, such as telephone directories. This new type of public phone was introduced to tighten security measures.

Fig. Trends in number of public phones



At the end of fiscal year		1989	1990	1991	1992	1993	1994	1995	1996	1997	
NTT	Public phone in front of a store	Red public phone	149,536	106,394	82,102	57,045	35,168	24	0	0	
	Public phone on street	Blue public phone	26,441	16,726	11,062	5,884	2,359	1	0	0	
		Yellow public phone	122,969	67,511	42,228	19,977	7,243	2	0	0	
		Card telephone	530,031	641,379	694,807	743,371	775,361	800,745	799,306	793,870	777,200
		Digital public phone	359	910	2,807	8,630	22,110	35,469	47,180	71,992	97,464
Subtotal		828,977	832,010	830,199	826,277	820,131	800,772	799,306	793,870	777,200	
Japan Telecom Co., Ltd.		459	698	875	1,081	1,110	1,150	1,157	1,174	1,213	
KDD Corp.		29	27	50	50	50	52	57	57	57	
Total		829,465	832,735	831,124	827,408	821,291	801,974	800,520	795,101	778,470	
Growth rate		0.28	0.39	-0.19	-0.45	-0.74	-2.35	-0.18	-0.68	-2.09	

- Notes: 1. The figures for public phone on street indicate the total of box type and the desk-top type.
 2. The figures for red public phone in front of store indicate the total of 100-yen type and 10-yen type.
 3. The figures in and after December 1998 are for KDD. The figures before December 1998 are for Teleway.

Source: MPT

II-4-6 International telephone services

Among the top ten destinations for international calls, first place goes to the U.S., with seven other places occupied by Asian countries.

Two types of international telephone service are available in Japan: direct-dialing, or automatic, services and those provided through an operator. In terms of total duration, 95.5% of international calls were automatic in fiscal 1997 (Fig. 1). By the end of 1998, automatic calls could be made to 230 destinations worldwide (Table).

Of the total duration of international calls from Japan in fiscal 1997, international NCCs (JT and IDC) held a 37.4% share, up 1.9 percentage points

from the previous fiscal year, while KDD held a 62.6% share (Fig. 2).

International Virtual Private Network (VPN) services are provided on a global scale through public international communications networks, rather than leased circuits. In Japan, KDD has offered VPN services since fiscal 1991. At present, all three of Japan's international carriers provide these services, which were available to 28 destinations as of the end of 1998 (Table). The total number of sub-

II-4

Table Number of foreign countries and areas accessible by international telephone services (end of 1998)

Services		Accessible countries
Telephone services	Calls via direct-dialing	230
	Calls connected by an operator	235
International VPN services		28
Incoming calls paid for by the receiver, or paid for with credit or other type of charge cards	Calls connected by an operator at a Japanese carrier	85
	Calls via direct-dialing	64

Fig. 1 Ratio of automatic to operator-connected outgoing international calls in fiscal 1997 (based on total duration)

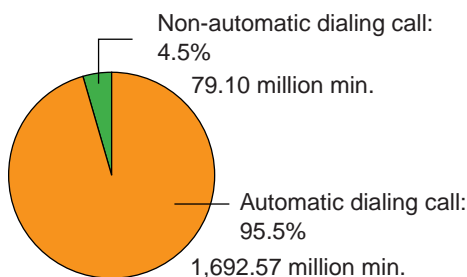
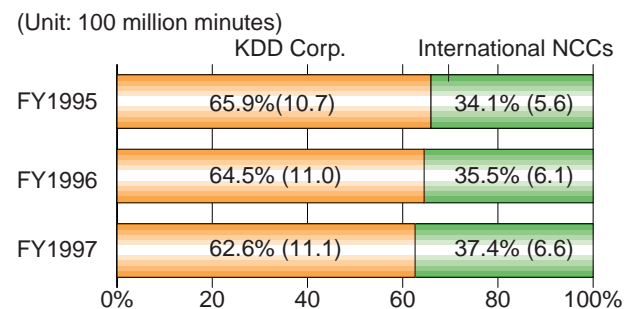
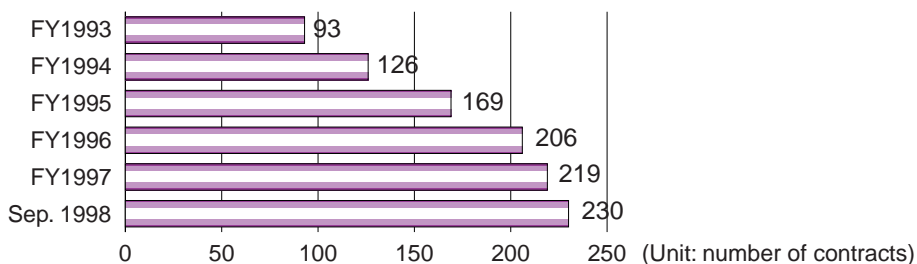


Fig. 2 Share of outgoing international calls market held by KDD and international NCCs (based on total duration)



Source: Table 1, Figs. 1 and 2 are based on MPT data.

Fig. 3 Growth of international VPN service contracts



Sources: Relevant carriers

scribers to international VPN services provided by KDD, JT and IDC was 230 as of the end of September 1998, and the number has steadily increased over the last several years (Fig. 3).

For all three international telecommunications carriers, the total number of both incoming and outgoing calls in fiscal 1997 was 798.48 million, up 4.9% from the previous fiscal year. The total duration of these calls was 3,467.0 million minutes, up 5.5% from the previous fiscal year (Fig. 4; Refer to Appendix 18). International calls from Japan made up 1,771.67 million minutes of the total, up 3.6% from the previous fiscal year, while incoming calls

accounted for 1,635.03 million minutes (up 7.6% from the previous fiscal year). As these figures illustrate, outgoing calls from Japan tend to exceed incoming ones. However, the gap has been shrinking year by year (Fig. 5).

In terms of the duration of international calls from Japan, those to the U.S. had the largest single share of 21.4%. Among the top 10 destinations overseas, seven were countries or areas in Asia. Together, the top 10 destinations accounted for more than 70% of all international calls from Japan (Figs. 6 and 7).

Fig. 4 Trends in total number and duration of incoming and outgoing international calls

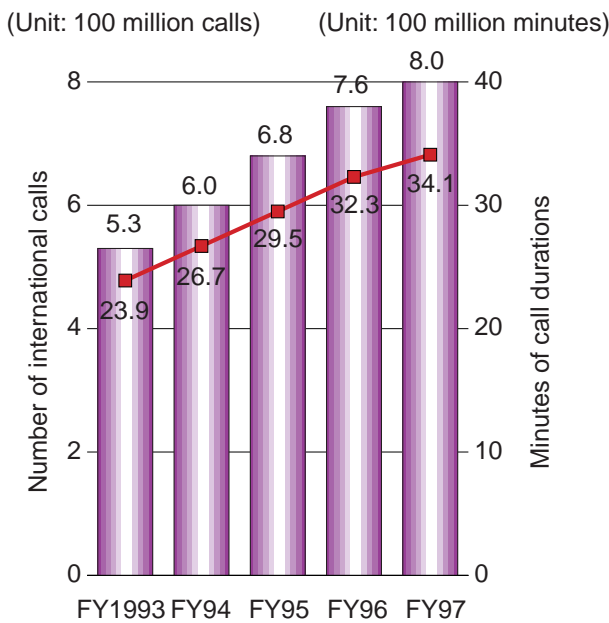
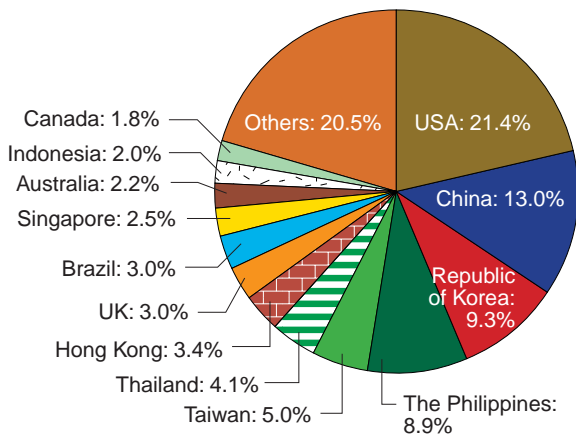


Fig. 6 Share of total duration of outgoing calls held by destination countries or areas



Source: MPT

Fig. 5 Trends in total duration of incoming and outgoing international calls

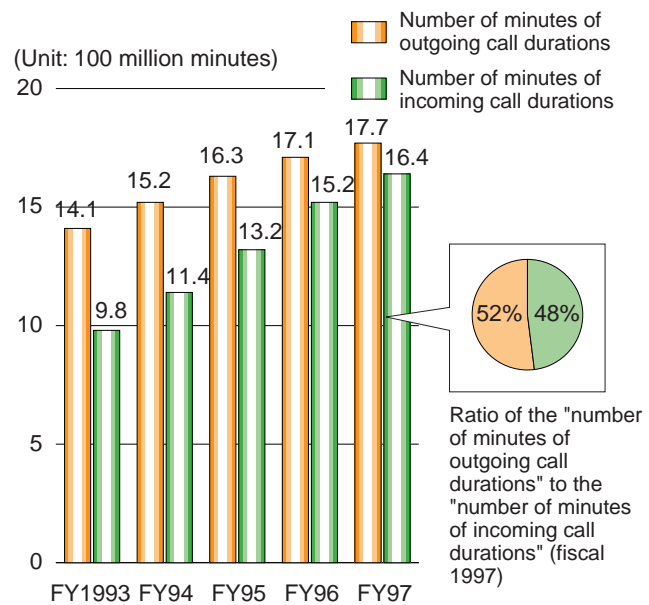
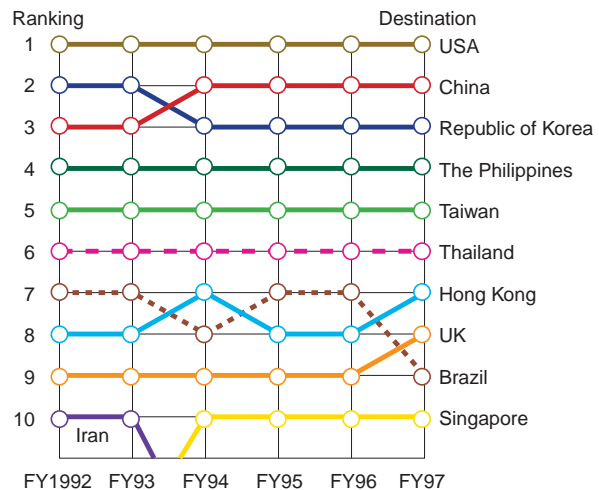


Fig. 7 Trends in top 10 destinations for outgoing international calls (based on total duration)



II-4-7 Cellular/car phones

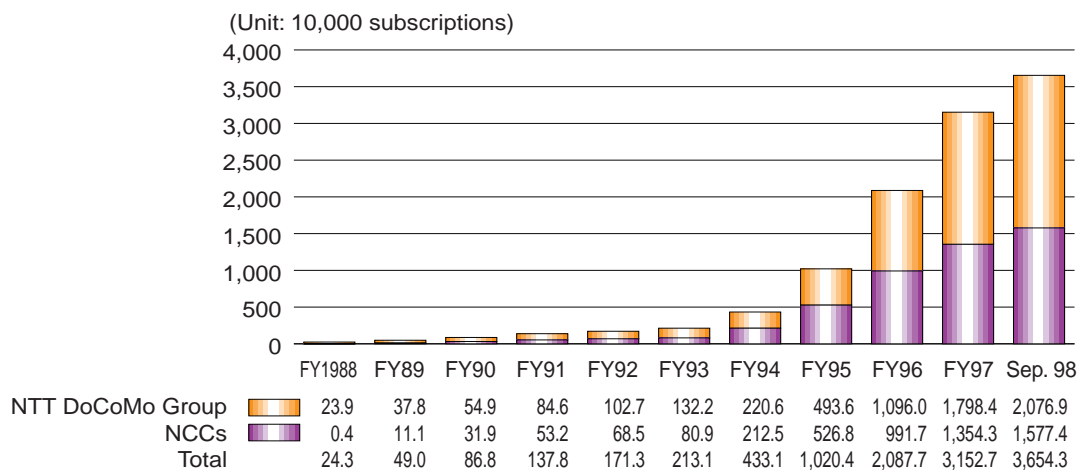
The number of subscribers expanded steadily as in the previous fiscal year.

Cellular and car phone services in Japan are provided by the NTT DoCoMo Group and 21 new common carriers (NCCs). The total number of subscribers has expanded rapidly, and by the end of September 1998, it had reached 36.543 million, up 40.1% from the end of September 1997. Of these, subscribers to services provided by the NTT DoCoMo Group numbered 20.769 million, up 44.2% from the end of September 1997, while subscribers to NCCs' services totaled 15.774 million, up 35.1%. The market share of NCCs was 43.2%, down 1.6

percentage points (Fig. 1).

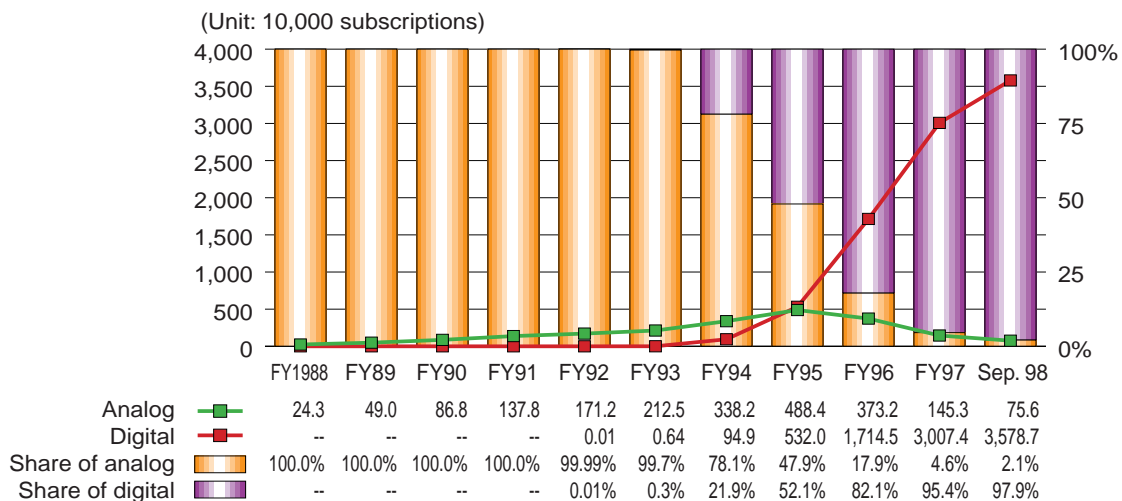
Over a similar period, use of the digital system for cellular telephony has largely replaced use of the analog system. As of the end of September 1998, a total of 97.9% of subscribers used digital system services, up 7.4 percentage points from the end of September 1997. There were 756,000 subscribers using the analog system, down 69.3%, and 35.787 million subscribers to the digital system, up 51.5% (Fig. 2).

Fig. 1 Trends in number of subscribers



Note: Subscriber figures of NTT DoCoMo Group before fiscal 1991 indicate those of NTT.

Fig. 2 Trends in number of subscribers for analog system vs. digital system



Note: Subscriber figures of NTT DoCoMo Group before fiscal 1991 indicate those of NTT.

Sources: Related carriers

II-4-8 Personal Handyphone System (PHS)

The number of subscribers has been falling from its September 1997 peak.

II-4

The PHS service was launched in the Tokyo metropolitan area and in Sapporo, in July 1995. The number of subscribers at the end of September 1998 was 6.267 million, a drop of 11.3 percentage points from September 1997, when it hit a peak (Fig. 1).

However, the spread of data communications has led to steady rises since the service was launched in the number and duration of calls per subscriber per day, and in the average duration of calls. In fiscal 1997, each subscriber made an average 1.7

calls per day (up 0.3 calls from fiscal 1996), lasting a total 2 minutes and 44 seconds (up 32 seconds), while the average duration of calls was 1 minute and 36 seconds, up 7 seconds (Fig. 2).

Since problems that have arisen with PHS services, such as intermittent disconnection and inaccessibility inside buildings or away from city centers, are being addressed, MPT revised ministerial ordinances related to PHS services in December 1998 (Table).

Fig. 1 Trends in the number of PHS subscribers

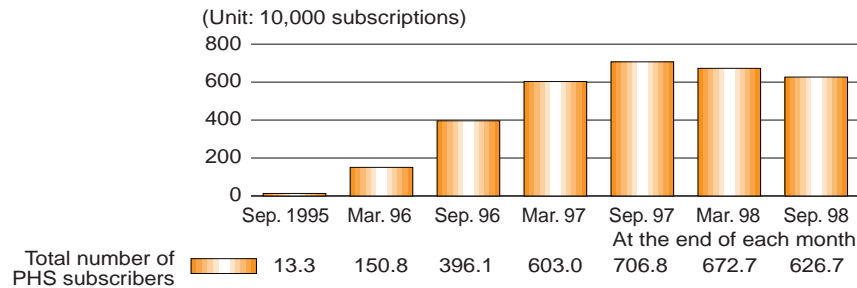
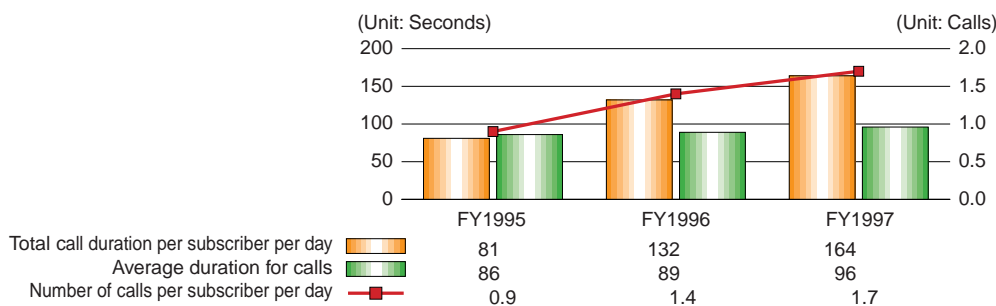


Fig. 2 Trends in the number and duration of calls per subscriber per day, and in the average duration of calls



Note: Numbers of active subscribers were used for calculation.

Source: MPT

Table Major revisions to ministerial ordinances on PHS

- Introduction of transportable repeaters which can provide efficient services indoors environment such as within a building
 - Decided technical requirements for transportable repeaters with less than 10 mW antenna power
- Expansion of coverage area of cell stations for public PHS
 - Raised the limit on antenna power for control channels to 2W.
 - Raised the limit on antenna gain from initial 10 dBi to 16 dBi for speech channel by utilizing adaptive array antennas.
- Revision of standards for sharing the frequency between digital cordless telephone and public PHS
 - In order to relieve the shortage of spectrum for public PHS in shopping and entertainment districts, public PHS cell stations whose antenna power is less than 20 mW and antenna gain is less than 10 dBi and digital cordless phone were allowed to share the same frequency.
- Functional improvement of PHS terminals and digital cordless telephones (master units)
 - In order to improve its mobility and speech quality, raises the limit of antenna gain for digital cordless telephones (master units) and PHS terminals from initial 2.14 dBi to 4 dBi.
- Reconsideration of the name of "simple portable telephone"
 - Considering recent circumstances that PHS functions have been improved (for instance, high-speed data transmission), the official name in the ministerial ordinances were changed from "simple portable telephone" to PHS.

Note: "dBi" is a unit of feature of antenna absolute gains.

II-4-9 Radio paging service

The number of subscribers has dropped dramatically after hitting a peak in fiscal 1995.

At the end of September 1998, the number of subscribers to radio paging services in Japan, provided by the NTT DoCoMo Group and 31 NCCs, was 5.25 million, a drop of 41.6% from September 1997 (Fig. 1). The figure has been falling since the end of fiscal 1995, in line with the rise in the number of subscribers to mobile phone services, as well as the launching of services to transmit short text messages via PHS and cellular phones.

Among the total number of subscribers to radio paging services at the end of September 1998, those using NTT DoCoMo numbered 2.89 million, down 42.8% from September 1997, while subscribers to

NCCs totaled 2.36 million, a drop of 40.1%. The market share of NCCs was 44.9% (Fig. 1).

Radio pagers can be either rented or owned and maintained by the customer. The ownership system has become dominant since it was introduced in March 1995, and at the end of September 1998 it accounted for 65.4% of radio pagers in use, with the remaining 34.6% being rented (Fig. 2).

In addition, the market is now dominated by new types of pager that can display short text messages as well as calling users with tone signals. This type of terminal occupied 90.0% of the radio-paging market as of the end of September 1998 (Fig. 3).

Fig. 1 Trends in radio paging subscriptions, and market shares of NTT DoCoMo Group and NCCs

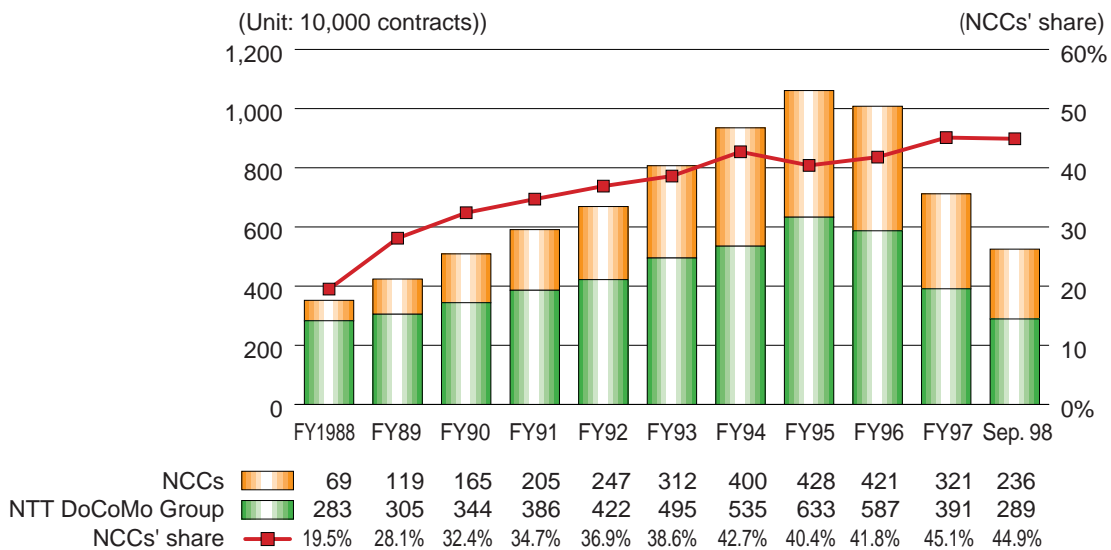


Fig. 2 The switch to "customer owned and maintained" (COAM) pagers

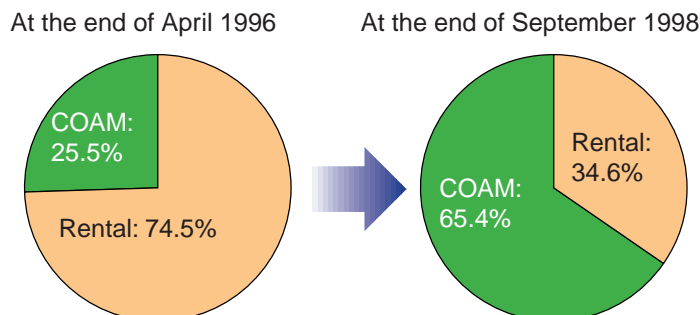
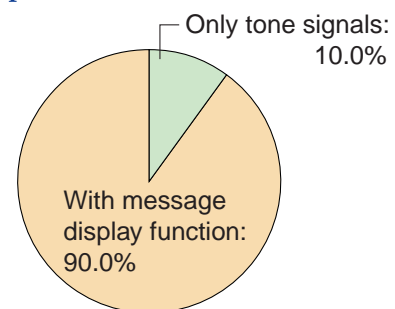


Fig. 3 Growth in market share of pagers with text display functions (end of September 1998)



Sources: Relevant companies

II-4-10 Satellite mobile communications

Satellite mobile communications service using orbiting satellites was launched.

II-4

There are two types of mobile telecommunications systems using satellites: one uses geostationary satellites at altitude of 36,000 kilometers above the Equator, and the other uses orbiting satellites. Both systems can provide services to ships, airplanes, cars, etc.

In Japan, mobile communications services via geostationary satellites are provided using the Inmarsat or N-STAR satellites. KDD launched its services for shipping via Inmarsat in 1982. Technological innovations allowed the service to be applied later to other fields, and today it can be received on land via portable equipment. NTT DoCoMo Group began using N-STAR in March 1996 to provide services in Japan and surrounding seas up to 200 nautical miles from the Japanese coastline.

Nippon Iridium Corp. launched Japan's first mo-

bile communications service using orbiting satellites in January 1999 (Table and Fig).

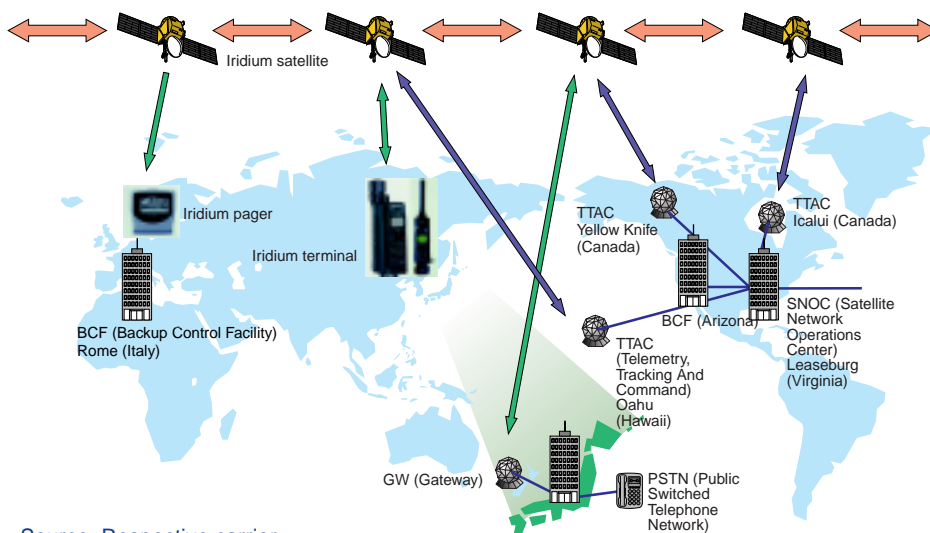
The Iridium System will provide its services for every portion of the globe using a total of 66 satellites — placing 11 satellites on each of six different polar orbits about 780 kilometers above the Earth's surface. The service is expected to be a new communications tool in the area where conventional communications tools cannot reach such as in the sea and in the mountain area.

Service menus of the Iridium system include not only ordinary telephone services but also radio paging services. In May 1998, ORBCOMM Japan Ltd. was granted a Type I telecommunications business license, and launched interactive data communications services and positioning services using 36 orbiting satellites in March 1999.

Table Outline of satellite communications services using orbiting satellites

System	Iridium	ORBCOMM	Global Star	ICO
Service area	All over the world	All over the world	Between 70°N and 70°S	All over the world
Number of satellites	66+6 (back-up satellites)	36	48+8 (back-up satellites)	10+2 (back-up satellites)
Altitude of the orbit	780 km	825 km	1,414 km	10,355 km
Service menu	Telephone, data, radio paging, facsimile	Data, positioning (mobile location management system including locating delivery trucks and assigning a delivery job to them)	Telephone, data, radio paging, facsimile and positioning	Telephone, data, radio paging and facsimile
Service in	January 1, 1999	March 30, 1999	By the end of 1999 (scheduled)	August 2000 (scheduled)

Fig. Iridium network system diagram



Iridium terminals



Height: about 146 to 193 mm
Width: about 57 to 62 mm
Depth: about 48 to 68 mm
Weight: about 400 to 454 g



Height: about 72.3 mm
Width: about 77 mm
Depth: about 22.5 mm
Weight: about 118 g

Source: Respective carrier

II-4-11 Leased circuit services in Japan

The number of high-speed digital transmission lines has been rapidly increasing.

There are two kinds of services of the ordinary leased circuit service: the analog type or band width use service that is suitable for telephone and facsimile, and the digital type or code transmission service that is suitable for data transmission, at the end of fiscal 1997, the total number of circuits was 916,395, a drop of 6.8% from the previous fiscal year (Fig. 1; Refer to Appendix 19).

There are also leased circuit services which provide high-speed, large-capacity data transmission. The service menus include high-speed circuits (from 64 kbps to 6 Mbps) and super high-speed cir-

cuits (from 32-Mbps to 150-Mbps). The total number of these types of leased circuit in Japan at the end of fiscal 1997 was 193,108, up 51.2% from the previous fiscal year (Refer to Appendix 20). These figures show that, in contrast with a decline in the number of ordinary leased circuits, the number of circuits for high-speed digital transmissions has been steadily rising. However, among high-speed circuits, demand is concentrated on relatively lower speeds, with 64-kbps and 128-kbps circuits jointly occupying more than 80% of the market at the end of fiscal 1997 (Fig. 2).

Fig. 1 Trends in number of leased circuits in Japan

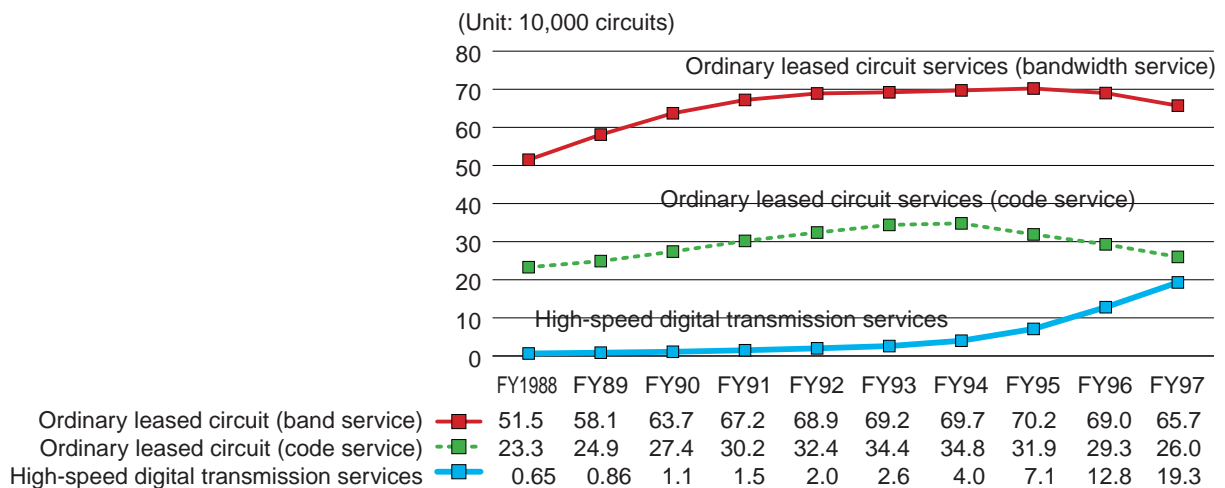
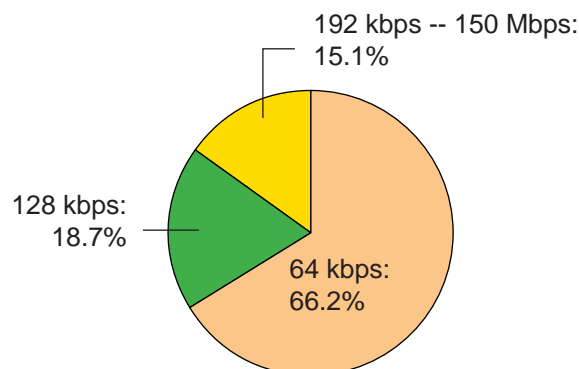


Fig. 2 Market share of high-speed digital transmission services by circuit speed (end of fiscal 1997)



Source: MPT

II-4-12 International leased circuit services

Nearly 85% of circuits are middle or high-speed code transmission lines

II-4

Telecommunications service

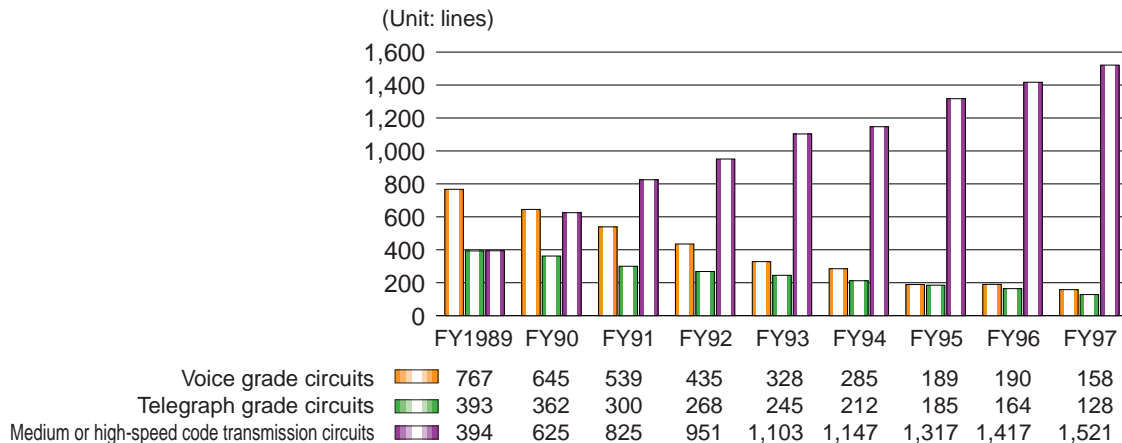
International leased circuits are provided by KDD, JT and IDC. At the end of fiscal 1997 they had a total of 1,807 lines, up 2.0% from the previous fiscal year. By service category, the number of voice grade circuits was 158, a drop of 16.8% from the previous fiscal year, and that of telegraph grade lines was 128 lines, a drop of 22.0% (Fig. 1).

In contrast with these declines, the total number of middle or high-speed code transmission circuits has continued to rise and amounted to 1,521, up 7.3%, at the end of fiscal 1997. They occupied 84.2% (up 4.2 percentage points from the previous fiscal

year) of the total number of international leased circuits (Refer to Appendix 21).

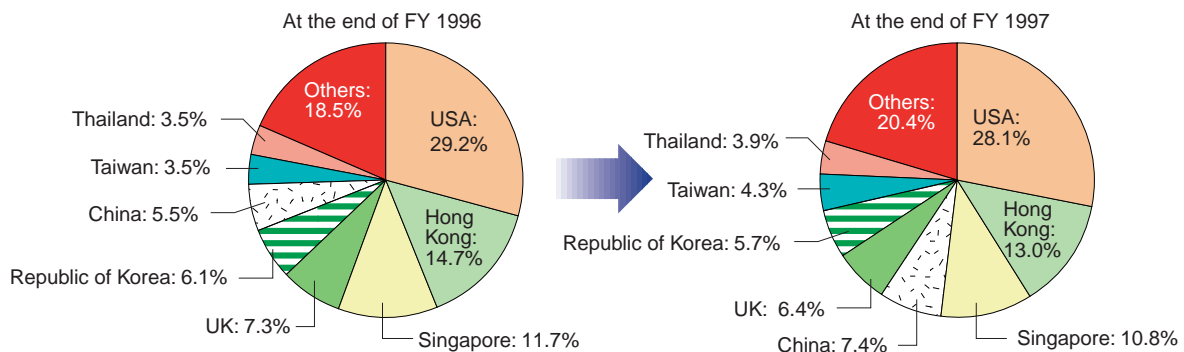
The top three international destinations for transmissions via medium or high-speed code circuits - the U.S., Hong Kong and Singapore -- did not change between fiscal 1996 and fiscal 1997. However, their shares of total transmissions dropped. Among destinations which expanded their shares was China, which accounted for 7.4% of all transmissions in fiscal 1997, up 2.3 percentage points from the previous fiscal year and overtaking the U.K. and Republic of Korea to rank fourth (Fig. 2).

Fig. 1 Trends in international leased circuit services



- Notes:
1. Voice-grade circuits are band services and are mostly used for telephony.
 2. Telegraph-grade circuits are code services with a speed of up to 200 bps. They are mostly used for teletype communications and data transmission.
 3. Medium or high-speed code transmission circuits have communications speeds from 1,200-bps to 45-Mbps. They are mostly used for data transmission, high-speed file transfer and video conferencing.

Fig. 2 Destinations of international leased circuit services (medium or high-speed code transmission circuits)



Source: MPT

II-4-13 New services

Most new services launched in and after 1998 are related to mobile telephony, with a trend toward data communications functions, including text messaging and information services.

Most new services launched in and after 1998 are cellular phone/PHS-related services (Table). Trends in these new services are centering on data communications functions including text messaging, information services and others.

It is anticipated that development of new services will be accelerated mostly for these mobile phone services linked with the Internet (Refer to I-2-4-(3) and I-Column 6).

II-4

Table New services launched in 1998 and early 1999

Subscriber telephone	Cellular telephone	PHS	Radio paging
Numbers indicate Month.			
		1998	
1. Telephone relay service <i>Tokyo Denwa</i> (TTNet)	2. Email receiving notification service <i>EV mail</i> (Cellular)	2. Remote watching and control, data communications service <i>Telemetering 98</i> (NTT DoCoMo)	
2. Number announcement service (caller ID) <i>Number Display Service</i> (NTT)	3. Charged information services <i>Mobile Q</i> (NTT DoCoMo)	3. Text message service <i>Paldio E, I mail</i> (NTT DoCoMo) <i>P mail DX</i> (DDI Pocket) <i>Mecha E mail</i> (ASTEL)	
3. Voice mail service <i>Saigai-yo</i> (in case of natural disaster) <i>Dengon Dial</i> (NTT)	4. Fax storage service <i>Fax Ban</i> (NTT DoCoMo)	4. Called party limitation service <i>Anshin-da-phone</i> (DDI Pocket)	
7. Called party billing service <i>TTNet Free Plan</i> (TTNet)	Annoyance call blocking services <i>Meiwakudenwa Gekitai Service</i> (TU-KA)	Voice message service <i>Asteler Board</i> (ASTEL)	
Multiple prepaid card <i>BANGO!</i> (KDD)	7. CDMA system cellular phone service <i>cdmaOne</i> (Cellular)	Remote watching and control, data communications service <i>Telemetering</i> (DDI Pocket)	
	8. Annoyance call blocking services <i>Gekitai-kun</i> (Cellular)	5. Location information service <i>Imadoko Service</i> (NTT DoCoMo)	
	Caller number requesting service <i>Oshiete Number Service</i> (Cellular)	Remote watching and control, data communications service <i>Asteller Telemetering</i> (ASTEL)	
	9. Up to three terminals can be used with one subscriber number <i>Selecphone</i> (NTT DoCoMo)	6. WWW access service <i>Paldio Net Surfing</i> (NTT DoCoMo)	
	10. Text message service <i>Sky Message</i> (TU-KA)	Anshin-da-phone for data communications <i>Two LINK DATA</i> (DDI Pocket)	
	Annoyance call blocking services <i>Number Block</i> (Digital Phone)	Up to four parties can talk each other (party line) <i>WaiWai Talk</i> (ASTEL)	
	11. Internet access service <i>Mopera</i> (NTT DoCoMo)	7. More than two parties can talk each other (party line) <i>Voice Meeting</i> (DDI Pocket)	
	Incoming call notice music setting service <i>Sky Melody</i> (Digital Phone)	8. Text message service <i>A mail plus</i> (ASTEL)	
	Text information distribution service <i>Sky Web</i> (Digital Phone)	10. Text information and mail service <i>MOZIO</i> (ASTEL)	
		Location information services <i>P Navi/Data</i> (ASTEL)	
		11. <i>64 kbps high-speed data transmission service</i> (ASTEL)	
		Called party limitation service <i>Kime Talk</i> (ASTEL)	
			8. Can receive a call with email address <i>Bell Kara Mail</i> (NTT DoCoMo)
		1999	
	1. Interconnection with Pmail (PHS) <i>Tanoshi Mail</i> (Cellular)	2. Non-voice communications service <i>Moji Denwa</i> (DDI Pocket)	2. Calling party billing service <i>02 DO</i> (NTT DoCoMo)
	Annoyance call blocking services <i>Meiwaku Denwa Stop Service</i> (NTT DoCoMo)	Mail-box status information service with text message <i>Mail Informing Service</i> (DDI Pocket)	<i>020 Plan</i> (Tokyo Telemessage)
	Text information distribution service <i>News Mail</i> (TU-KA)	3. Simultaneous Pmail transmission to multiple addresses <i>P Mail Issei Soshin</i> (DDI Pocket)	
	2. Online service <i>iMode</i> (NTT DoCoMo)	Informing communications fee with voice <i>Air time charges announcing services</i>	

Notes: 1. Names in parentheses are abbreviations of carriers' names as follows:

NTT DoCoMo = NTT DoCoMo Group; Cellular = Cellular Group; Digital Phone = Digital Phone Group; TU-KA = TU-KA Group; Digital TU-KA = Digital TU-KA Group; DDI Pocket = DDI Pocket Group; ASTEL = ASTEL Group.

2. iMode is an additional service using packet communications technology.

3. Months indicate the first implementation of the service within the group.

Sources: Relevant carriers

1. Text message and information distribution services

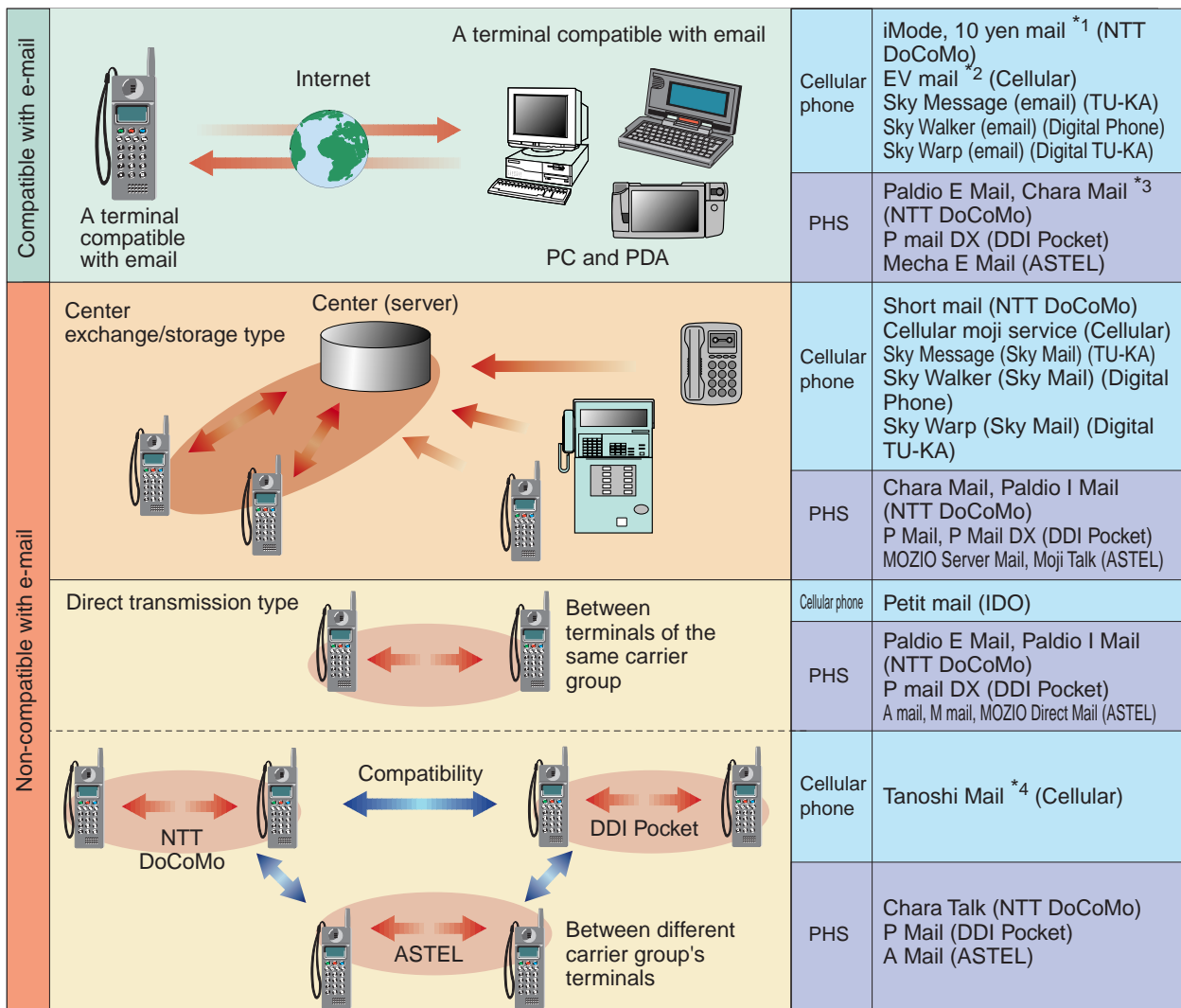
New services that enable text messages to be sent via cellular phones and PHS have been gaining popularity in Japan, especially among younger users. There are two categories of these services, based on whether they can handle e-mail (Fig. 1).

In fiscal 1998, three PHS carrier groups in Japan (NTT DoCoMo Group, DDI Pocket Group and ASTEL Group) harmonized their text messaging functions that allow direct communications between two terminals. As a result, PHS users became able to exchange messages with subscribers to different carriers.

Many firms in the mobile communications market, including cellular carriers, offer a variety of information distribution services using the text message function. These services are of two main types: the “on-demand” type that subscribers use at any time when they want particular information, and the “automated distribution” type that provides preselected information, such as news and weather forecasts, at designated times (Fig. 2).

The scope of services available through mobile communications terminals is expected to continue to expand, making them highly functional as ways to access information as well as to make conventional calls.

Fig. 1 Text messaging services



Notes: 1. Names in parentheses are abbreviations of carriers' names as follows:
 NTT DoCoMo = NTT DoCoMo Group; Cellular = Cellular Group; Digital Phone = Digital Phone Group; TU-KA = TU-KA Group; Digital TU-KA = Digital TU-KA Group; DDI Pocket = DDI Pocket Group; ASTEL = ASTEL Group.
 2. This service was jointly developed by NTT DoCoMo and Master Net (ISP). Users are required to subscribe to Master Net.
 3. These services are limited to receiving e-mail.
 4. This service is limited to communicating with P mail (PHS).

Sources: Relevant carriers

2. Location information service

Recently, PHS carriers introduced a service to give subscribers information about where they are and give details of nearby facilities. This makes use of the small size of PHS transmission cells compared with those used by cellular or car phone systems. A typical PHS cell station, for instance, covers an area with a radius of just 100 -500 meters (Fig. 3).

The NTT DoCoMo Group has been providing its "Imadoko" location service since May 1998, and ASTEL Tokyo has been providing the "P Navi" service since October 1998. These services were launched in a bid to expand PHS usage

3. Prepaid card

In July 1998, Teleway (now part of KDD) started

selling a multiple-use prepaid card called "BANGO!" that allows users to make a phone call at the flat rate of 20 yen (excluding tax) per minute to any part of Japan at any time of day, or to receive various information services. Each card has a number that is used as a password which does not require registration.

TU-KA Phone Kansai launched a prepaid cellular telephone service "Pre-K" in October 1998 (Fig. 4). Users do not pay any basic monthly charge, but buy a "Pre-K" card as an advance payment for communications fees, and make calls using TU-KA Phone Kansai terminals which are designed for prepaid use. As of the end of March 1999, there were 12,000 terminals in use for the service, which the carrier plans to limit to the Kansai area of western Japan for the time being.

Fig. 2 Outline of text information distribution service

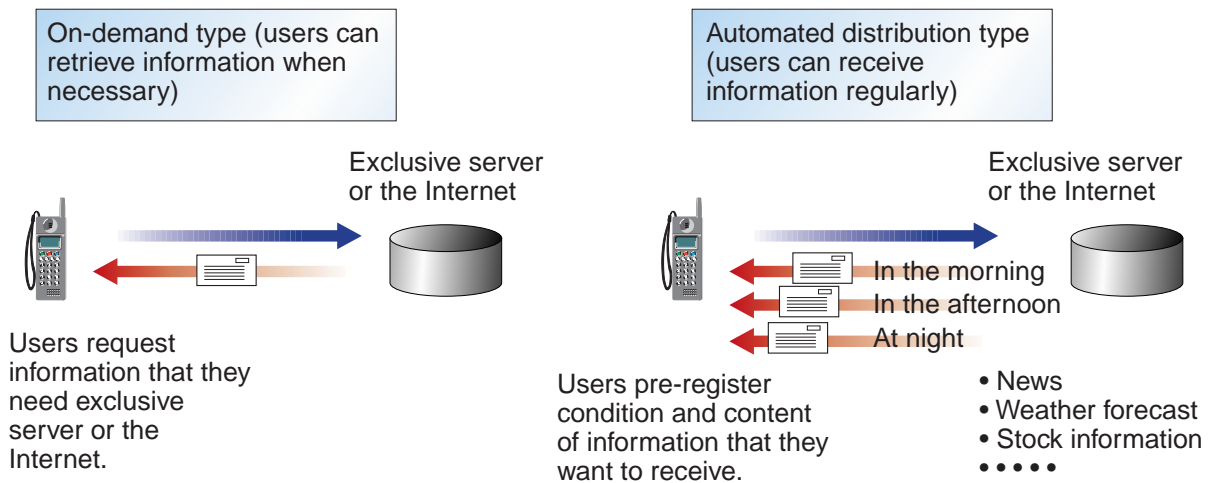
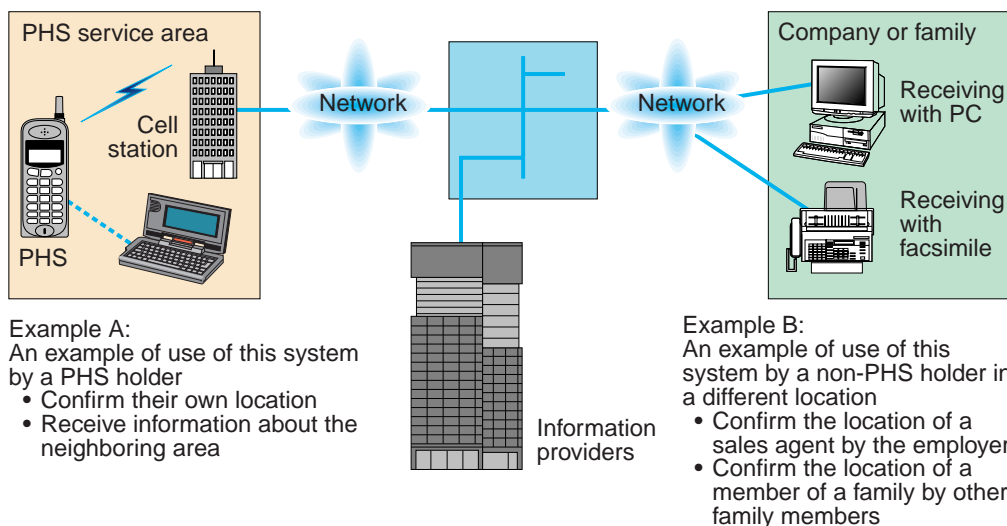


Fig. 3 Outline of location information services



4. Limited destinations for outgoing calls

DDI Pocket Group launched a new low rate PHS service with a limited number of called parties in April 1998. Users of this Anshin-da-phone can make a phone call to only three pre-registered numbers (initially users were able to make a call to only two numbers). The basic monthly fee is about one third of the standard PHS service.

Among the ASTEL Group companies, ASTEL Kansai in November 1998 launched a similar called party limitation service, "Kime Talk."

After that other carriers in the group have launched similar services one after another.

By limiting the number of called parties, users can get rid of a variety of social and economical

concerns. For instance they can prevent getting a expensive telephone bill. They are expected to be used by children, homemakers, and the elderly as a communications tool among family members.

5. Caller billing service

NTT DoCoMo Group and Tokyo Telemessage Inc. introduced in February 1999 a service by which callers bear the entire cost of communications via radio pagers.

Since in the new billing system the caller bears communications fee for both paging and sending a message, the burden for the called party or the pager subscriber will be eliminated or significantly lightened (Fig. 5).

Fig. 4 Outline of Pre-K system

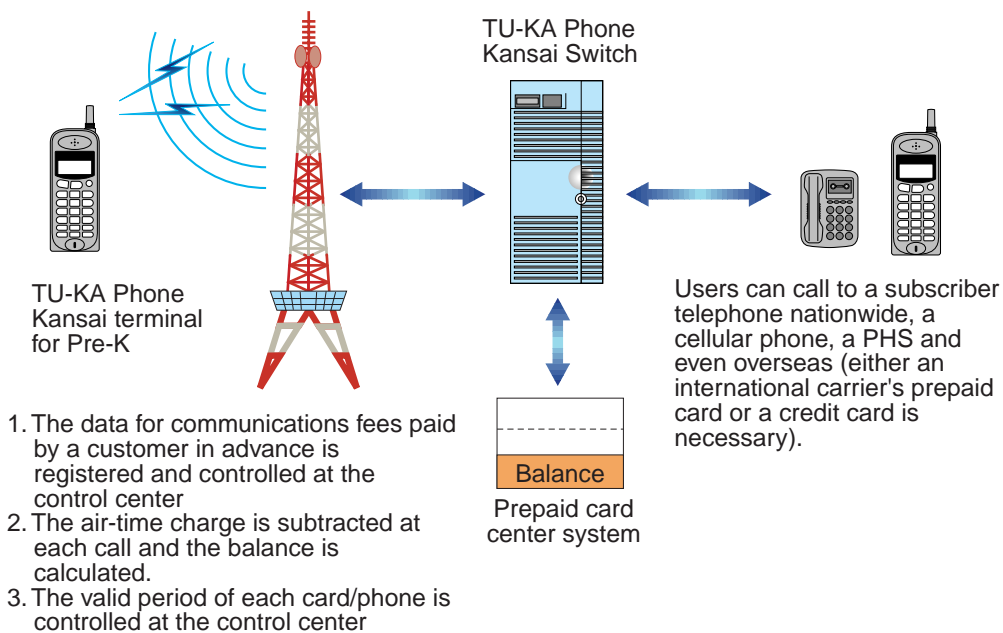


Fig. 5 Caller billing service

