

II-11-1 Telecommunications markets in foreign countries

(1) The United States

The U.S. is the world's largest telecommunications market, and that market has been steadily expanding.

The total revenues in 1998 of basic voice and data services in the U.S. are estimated at \$233.6 billion. The total number of employees in the US telecommunications industry was on the decline until 1993, but in 1994 the number returned to its 1989 level and has been rising since (Table 1).

In such an expansive atmosphere, a lot of long-distance carriers (interexchange carriers: IECs or IXC), more than 1,300 regional telecommunications carriers (local exchange carriers: LECs) and several dozen mobile carriers (radio common carriers: RCCs) are competing with each other in the

US telecommunications market (Table 2).

Recognizing telecommunications as a strategic industry, in 1996 the U.S. drastically revised the Communications Act of 1933, and created a new structure that let long-distance carriers, regional telecommunications carriers and cable TV operators enter each other's markets. Since then, innovation of telecommunications technology has been actively promoted. Making full use of state-of-the-art technology, such as WDM (Wavelength Division Multiplexing, which multiplexes multiple data over one optical fiber by changing wavelength) and IP (In-

Table 1 Current status and forecast of U.S. telecommunications services

	1989	1992	1993	1994	1995	1996 Estimate	1997 Estimate	1998 Forecast
Operating revenues (US\$ 1 million)	158,068	160,353	172,860	183,214	199,005	213,532	224,636	233,621
Total number of employees (Unit: 1,000)	901	893	886	901	924	955	--	--

Source: "U.S. Industry & Trade Outlook 1998," U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA)

Table 2 Outlines of U.S. telecommunications market

			Regulators	Major carriers	
Fixed telecommunications	Facilities-based carriers	Long-distance communications	Interstate/international communications	Federal Communications Commission (FCC)	1. Nationwide long-distance carriers: AT&T Corp., Sprint Corp., MCI Communications Corp. and WorldCom, Inc. (Now, MCI WorldCom, Inc.) 2. Regional carriers
			Intrastate long-distance communications		
		Regional communications	Intrastate short-distance communications	State Public Utilities Commission (PUC)	1. Existing regional carriers such as RBOCs, GTE Corp., etc. (about 1,300 companies) 2. CAPs (Competitive access provider) 3. Facilities-based local service providers 4. Cable system operators 5. Others
			Local communications		
	Reseller		Interstate/international communications	FCC	1. Nationwide resellers 2. Dial-around resellers 3. Prepaid-card resellers 4. Local service resellers (without facilities) 5. Others
			Intrastate communications	PUC	
Local communications					
Mobile communications	Cellular telephone/Personal Communications System (PCS)		FCC	AT&T Corp., Bell Atlantic Corp., SBC Communications Inc., GTE Corp.	
	Radio paging		FCC	Paging Network, Inc., Metrocall, Inc., Arch Communications Group, Inc.	

Sources: Various data

ternet Protocol), new carriers such as Qwest Communications International Inc. and Level 3 Communications Inc. have entered the market in succession. As a result, competition has become increasingly harsh.

In order to cope with such intense competition, large-scale mergers and acquisitions have been carried out, especially among conventional carriers and beyond business category boundaries. This trend is expected to continue for the time being (Table 3).

The June 1998 announcement of a merger between AT&T Corp., a long-distance carrier, and Tele-Communications Inc. (TCI), a cable TV opera-

tor, won much attention as a large-scale tie-up across business categories.

Meanwhile, in US regional telecommunications markets, there has been a series of mergers or acquisitions between pairs of companies in the same business category (Fig.). After the merger between SBC Communications Inc. and Ameritech Corp. in December 1998, the number of Regional Bell Operating Companies (RBOCs) was reduced to four from seven. If the purchase of GTE Corp. by Bell Atlantic Corp. as announced in July 1998 is successful, a huge new regional communications carrier will result from M&A between an RBOC and a major independent regional carrier.

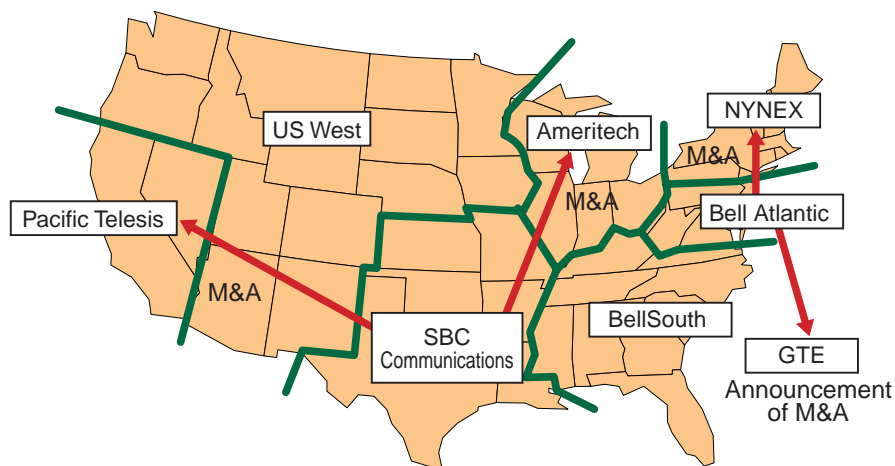
Table 3 Recent mergers, acquisitions and tie-ups in US telecommunications

Purchasing company	Business category	Purchased company	Business category	Year and month of M&A/tie-up	Purchase price
SBC Communications Inc.	Regional (RBOCs)	Pacific Telesis Corp.	Regional (RBOCs)	Concluded in Apr. 1997	\$16.7 billion
Bell Atlantic Corp.	Regional (RBOCs)	NYNEX Corp.	Regional (RBOCs)	Concluded in Aug. 1997	\$ 22.7 billion
AT&T Corp.	Long distance	Teleport Communications Group	Regional (independent)	Concluded in Jul. 1998	\$ 11.4 billion
WorldCom, Inc. (Now, MCI WorldCom, Inc.)	Long distance	MCI Communications Corp.	Long distance	Concluded in Sep. 1998	\$ 37.0 billion
SBC Communications Inc.	Regional (RBOCs)	Ameritech Corp.	Regional (RBOCs)	Concluded in Dec. 1998	\$ 62.0 billion
AT&T Corp.	Long distance	TeleCommunications, Inc. (TCI)	Cable TV operator	Announced in Jun. 1998	\$ 48.0 billion
Bell Atlantic Corp.	Regional (RBOCs)	GTE Corp.	Regional (independent)	Announced in Jul. 1998	\$ 52.8 billion
AT&T Corp.	Long distance	Vanguard Cellular Systems, Inc.	Cellular operator	Announced in Oct. 1998	\$ 0.85 billion
Vodafone Group (U.K.) (Now Vodafone AirTouch plc)	Cellular operator	AirTouch Communications, Inc.	Cellular operator	Announced in Jan. 1999	\$ 56.0 billion
AT&T Corp.*	Long distance	Time Warner Cable	Cable TV operator	Announced in Feb. 1999	--
Global Crossing Ltd.	Long distance	Frontier Corp.	Long distance	Announced in Mar. 1999	\$ 11.2 billion

Notes: 1. * indicates tie-up.
2. Purchase prices vary in different news reports.

Sources: Various data

Fig. Reorganization of U.S. regional telecommunications carriers



(2) Europe

Total liberalization of telecommunications markets from January 1998 has greatly intensified competition among carriers.

On January 1, 1998, all EU telecommunications markets for voice services were totally liberalized, except for certain member nations. Each EU member nation revised its domestic laws and established new regulatory bodies for telecommunications. Existing national, dominant telephone operating bodies have been privatized, and now they are competing intensely with new carriers which have concluded business alliance contracts with foreign carriers.

Of the three major European telecommunications markets (the U.K., Germany and France), competition in the U.K. and Germany is especially intense. The formerly dominant national telecommunication carriers (British Telecommunications plc and Deutsche Telekom AG) that provided all types of service including regional, long-distance and inter-

national, are being challenged by many new carriers (Table). As a result, the world's lowest-priced long-distance telecommunications tariffs were implemented in the U.K., while in Germany, long-distance telephone charges were reduced by up to 70% and Deutsche Telekom lost 20% of its share of the long-distance and international markets.

Typical ways for new players to enter EU telecommunications markets are for carriers based both inside and outside the EU to form a consortium to create the new entrant, or for major carriers in EU member nations to enter other nations' markets. Meanwhile, Deutsche Telekom and France Télécom are seeking either to form a strategic alliance or to merge.

The implementation of the European monetary union from January 1999 has also influenced com-

Table Current status of telecommunications market in major three countries

		U.K.		Germany		France					
Telecommunications administration		Department of Trade and Industry (DTI)		Federal Ministry of Economics and Technology		Ministry of Economy, Finance and Industry					
Regulator		Office of Telecommunications (OFTEL)		Regulatory Authority for Telecommunications and Posts (Reg TP)		Authority for the Regulation of Telecommunications (ART)					
Fixed telecommunications	Local/Regional	British Telecommunications plc	Cable and Wireless Communications plc	Cable telephony, fixed wireless and bypass business		Deutsche Telekom AG	Mannesmann Eurocom, Mannesmann o.tel.o	City carrier (Net Köln)	France Télécom	Cegetel	WorldCom and COLT Telecom Group plc
	Long distance			Energis plc							
	International			More than 40 carriers have won facilities-based licenses							
Mobile communications		4 carriers		4 carriers		4 carriers					
Market outlook		More than 150 carriers are competing with BT. In particular, cable telephony services have now more than 3.6 million subscribers, occupying more than 10% of the subscriber lines service market. Both long-distance communications charges and interconnection charges are at the world's lowest level.		More than 150 telephone services licenses have been granted as of the end of 1998. Among them 55 carriers are considering to launch their services. Deutsche Telekom has already lost 20% of the market share in long-distance and international business over the past year. Charges for long-distance services were reduced by up to 70%.		France Télécom has been strengthening its strategic alliance with Deutsche Telekom. Both carriers hold each other's share, exchange their executives, strengthen Global One (global outsourcing business), promote R&D and develop new services jointly.					

Sources: Various data

petition among carriers. With the introduction of the euro, it became easy to compare retail prices for circuits, interconnection charges and international adjustment prices, creating further pressure to bring down prices. Some carriers have introduced end-to-end services covering all of Europe and others have launched euro settlement services. The entire EU now forms a huge, united market.

Meanwhile, the EU implemented a variety of policies in 1998 to promote telecommunications. The status of competition among carriers in member nations was analyzed and a budget allocated for research and development in the field of telecommunications. The EU is also promoting discussion of regulatory frameworks suitable to an era of convergence between telecommunications, information technology and media. Recent EU policy initiatives can be summarized as follows:

1. "The European Commission's report on the liberalization of telecommunications services in the member states" (November 1998)

The report analyzed the status of liberalization of telecommunications services in EU member states, focusing on revision of domestic laws and implementation of new rules about 10 months after the opening of markets. The report concluded there were no major problems, although a limited number of nations needed to take certain corrective measures. It found that:

- 1) Most of the laws and regulations adopted by EU had been enacted as domestic laws in many member states.
- 2) Domestic laws in order to carry out major regulatory issues of EU's legal packages (domestic regulatory organizations, licensing, interconnections, universal services, tariffs, telephone numbering plan, spectrum allocation, rights of way) are now going to be implemented.
- 3) Dynamic telecommunications markets have been appearing in each state.

2. Worked out the fifth research and development framework program (October 1998)

This EU program provides a four-year framework for supporting research and development. In October 1998, a total allocation of 14.96 billion euros for the four years 1999 and 2002 was decided for the fifth research and development program. In the info-communications area, the User Friendly Information Society Project was given first priority, receiving a quarter of the budget.

3. Major movements regarding convergence communications, information technology and media in 1998

Regarding "The Green Paper on convergence of telecommunications media and information technology sectors and the implications for regulation" released in December 1997, public comments were invited. These public comments were compiled in July 1998. Major discussions are as follows:

- 1) Many respondents supported continuation of regulations based on the current industry structures.
- 2) Many respondents expressed concern that new separate regulatory frameworks would be introduced for regulating new business, in addition to current regulations.
- 3) Many respondents considered that it was too early to revise regulations, and instead they should be comprehensively reviewed over the longer term.

The EU Commission also invited comments by November 1998 on the following three issues:

- 1) Access to networks and digital gateways in a converging environment;
- 2) Creating a favorable framework for investment, innovation, and encouraging European content production, distribution and availability;
- 3) Ensuring a balanced approach to regulation.

The European Commission is going to compile public comments to these three issues, and will announce some issues to be dealt with at the telecommunications regulation review in 1999.

(3) Asia

Some Asian countries have seen delays in their plans to build communications networks, due to economic crises.

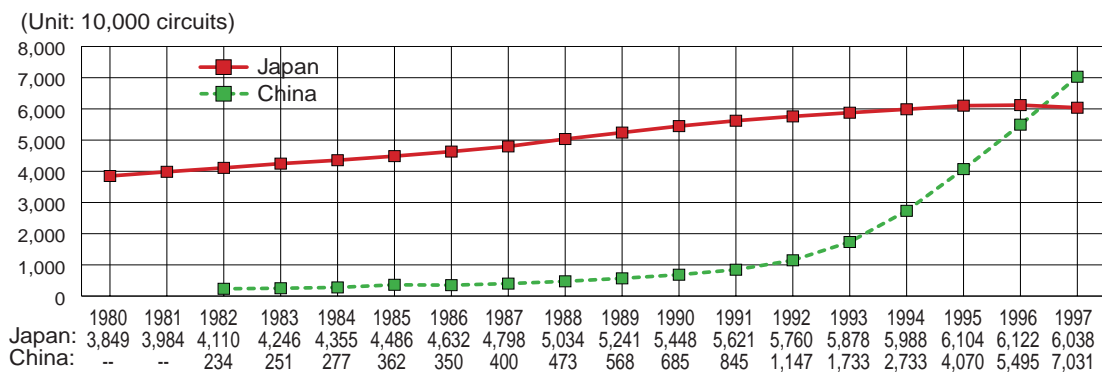
In the 1990s, Asian countries and areas developed rapidly as the engine for world economic development. Telecommunications was considered to be an indispensable element of infrastructure, and systems grew rapidly while the industry was being liberalized. However, since the currency and financial crises in Asia that began in 1997, the fate of the region has been strikingly different. China and some other countries and areas have continued to develop rapidly, but Indonesia and Thailand, which had been depending on foreign investments to expand their telecommunications networks, have been forced to revise their plans.

China has promoted economic policies for "reform and openness" since 1978 and has been achieving rapid economic development for the past 20 years with annual GDP growth of around 10%. Among the most important elements of infrastructure for supporting such a high economic growth rate are communications, electric power and trans-

port networks — all have been rapidly constructed under the active encouragement of the government. Thus, China's entire communications infrastructure has grown rapidly. For instance, China has overtaken Japan to become the country with the world's second largest number of fixed telephone lines, after the U.S. (Fig.) Meanwhile, the number of subscribers to cellular phones in China was 13.23 million at the end of 1997, and the number rose dramatically to 24.98 million at the end of 1998, the world's third largest following the U.S. and Japan. If the rate of expansion continues, it seems likely that the Chinese government's target of 40 million cellular phone subscribers by 2000 might be achieved.

Communications policies in China have been promoted according to the ninth five-year plan (1996 to 2000). However, rapid development of telecommunications meant that the targets in the plan were cleared early, and the figures were there-

Fig. Trends in number of subscriber lines (comparison of Japan and China)



Sources: NTT; "Yearbook of Statistics," ITU

Table 1 Outlines of the ninth five-year plan

	Unit	1996 Plan	1997 Plan	1998 Plan	1999 Plan	2000 (initial plan)	2000 (revised)
Number of fixed telephone circuits	10,000	5,095	6,267	7,583	9,024	10,500	11,200
Growth rate in the number of subscriber telephone circuits	%	25	23	21	19	16	24
Total investment into postal services and telecommunications business	100 million yuan	900	947	997	1,050	1,106	--
Accumulated figures	100 million yuan	900	1,847	2,844	3,894	5,000	6,329
Actual implemented figures (single year)	100 million yuan	1,036	1,245	1,754	--	--	--

Reference: the Eighth Five-year Plan

	Unit	1991 Plan	1992 Plan	1993 Plan	1994 Plan	1995 Plan	Accumulated figure
Total facilities and equipment investment into postal services and telecommunications business	100 million yuan	86	163	353	683	800	2,085

Source: Chinese Ministry of Posts and Telecommunications; "KDD Research Laboratories R&A," KDD Laboratories (May 1996 edition)

fore revised upwards in February 1998 (Table 1). If the latest target is reached, the penetration rate for telephone services (including cellular phones) will become 13% nationwide and 40% in urban areas by 2000.

An analysis on the impact of Asian currency and financial crisis since 1997 upon national-level construction project for info-communications infrastructure in other Asian countries and areas is as follows:

As well as in China, telecommunications development in Singapore has been comparatively unaffected by the Asian currency and financial crisis. The Singapore One Project has been promoted according to initial plans. However, the crisis has had a range of effects in other countries and areas, which have taken various measures to deal with it.

Indonesia largely depended on foreign investment to expand its telecommunications networks. When the value of its currency declined, the financial status of the telecommunications business de-

teriorated, as it was largely reliant upon foreign currency loans. In addition, it became difficult to procure telecommunications equipment from foreign countries. Therefore, Indonesia's plans have been delayed and the Nusantara 21 Project, for example, which was initially planned for completion by 2001, has been rescheduled for completion in 2004.

There has also been some delay in Malaysia's plan to build a "Multimedia Super Corridor" (MSC). Nevertheless, the scheduled move of the Prime Minister's office to the new administrative city has been delayed. The government put out a helping hand by increasing the ratio of its investment in the project's developer from the initial 10% to 65%, as part of its efforts to promote investment from the private sector.

Republic of Korea has recently decided to take new measures despite its difficult financial situation. Among these measures is a project to construct an ATM-based ultra high-speed communications network.

Table 2 National projects to build info-communications infrastructure in Asian countries and areas

National info-communications infrastructure construction projects	Public subsidies for and major revisions in these projects
<p>Singapore [Singapore One] 1. Phase 1 (1996-2001) Various services targeting families such as distance learning and electronic libraries are being provided. In addition, kiosks that provide public services will be constructed in public locations.</p> <p>2. Phase 2 (1999-2004) Along with improvements in the info-communications infrastructure, a wide variety of applications will be provided.</p>	<p>1. Governmental investment: Phase I Some 32 million Singapore dollars (about 2.66 billion yen) * For participating companies, a variety of support measures will be implemented, including such tax incentives as exemption from corporate tax and reduced investment tax, as well as telecommunications circuit privileges.</p> <p>2. governmental investment: Phase II Some 50 million Singapore dollars (about 4.15 billion yen)</p>
<p>Malaysia [Multimedia Super Corridor (MSC) Project] In order to achieve the "Vision 2020" that aims to transform Malaysia into an industrialized country by that year, a zone specializing in multimedia will be constructed around Kuala Lumpur as a hub for business and R&D, by inviting multinationals in the multimedia business to concentrate in the area. (Announced in August 1995)</p> <ol style="list-style-type: none"> 10-Gbps class optical fiber network will be installed in the entire MSC zone. Applications in eight areas, including electronic administration, telemedicine and distance learning, will be developed by 2000 and introduced nationwide from the MSC. Some privileges will be offered to authorized IT companies, such as tax incentives and relaxed restrictions on employing foreign labor. Laws will be enacted on, for example, digital signatures, copyright of electronic data, computer crime prevention and telemedicine. 	<p>Fiscal 1999 government budget</p> <ol style="list-style-type: none"> MSC-related budget 110 million Ringgit (about 3.5 billion yen) Y2K problem-related budget 100 million Ringgit (about 3.1 billion yen) <p>Major changes in the project</p> <ol style="list-style-type: none"> Delay in relocation of the Prime Minister's office to the new administrative city Government investment in the developer of the MSC zone raised from 10% to 65%
<p>Indonesia [Nusantara 21 Project] This is a project to link the Indonesian islands with high-speed backbone networks by 2004. First, optical fiber loops with either 155 Mbps or 2.5 Gbps will be constructed in each of the country's six zones. A nationwide high-speed network (Ring of Rings) will be constructed by linking each of these six zones to the others with 2.5-Gbps optical cables and satellites (PALAPA).</p>	<p>Total investment 13.7 billion U.S. dollars</p> <p>Major changes in the project Ending year for the project was changed from 2001 to 2004.</p>
<p>Republic of Korea [Plan to build an ultra high-speed info-communications network] A nationwide ultra high-speed info-communications network will be constructed by 2010, mainly using an optical fiber network but also using the existing telephone network by digitalizing and adding further speed, as well as integrating cable TV networks. The target is to have 7.5 million subscribers by 2002 and 30 million subscribers by 2010.</p> <p>[ATM-based ultra high-speed network construction project] The project was added to the previous plans to supplement the ultra high-speed info-communications network in order to meet the global trend toward the high-speed Internet. It will provide high-speed network services using ATM switches, scheduled for operational launch in the latter half of 1999.</p>	<p>Governmental budget for the construction of an ultra high-speed info-communications network by 2010 Some 3 trillion won (about 297 billion yen) * Total investment: some 32 trillion won (about 3.17 trillion yen)</p> <p>Major changes in the project The ATM-based ultra high-speed network construction project was added (January 1999).</p>

Source: MPT

II-11-2 Overseas trends in the digitalization of broadcasting

Digital terrestrial broadcasting has been launched in the U.S. and the U.K.

Digital terrestrial broadcasting began in the U.K. in September 1998 and in the U.S. in November 1998. The status of digital terrestrial broadcasting in both countries just after the launch of the new service was as follows:

1. United States

Digital terrestrial broadcasting was launched by 42 stations in 22 metropolitan areas in November 1998. Originally, the service was to begin in all ten of the country's biggest metropolitan areas; however, Chicago failed to launch the services because it could not secure the land needed for a transmission tower. On the other hand, services were launched in 13 additional metropolitan areas where the start date had originally been scheduled for later than 1999.

According to an announcement by the US Consumer Electronics Manufacturer Association (CEMA), a total of 13,176 digital television sets had been sold in the U.S. by January 9, 1999. The association estimates that 150,000 such sets will be sold by the end of 1999.

In the U.S., digital terrestrial broadcasting is being conducted with the high-definition television

(HDTV) format. Television sets that can receive HDTV programs retail at \$6,000 -10,000 and such high prices are considered to be a significant obstacle to the dense penetration of digital terrestrial TV broadcasting in the U.S.

2. United Kingdom

On September 23, 1998, the BBC launched the world's first digital terrestrial broadcasting. Satellite digital broadcasting was launched in the U.K. on October 1, 1998 and on November 15 a company jointly established by two British commercial broadcasters entered the digital terrestrial broadcasting market.

Usually, digital television sets are marketed prior to launch of such broadcasting services. However, in the U.K. digital television sets were put onto the market only after November 1998. Until then, these programs could not be seen at an ordinary home.

These sets are selling at about £400-500 more than ordinary sets. Their prices are lower than similar sets in the U.S., since they do not need to be equipped to receive high-definition television (HDTV) programs, which are not at present aired in the U.K.

Table Schedule for digitalization of broadcasting in foreign countries and regions

	Terrestrial digital broadcasting	Satellite broadcasting	Cable TV
U.S.	Launched in 1998	Launched in 1994	Launched in 1997
U.K.	Launched in 1998	Launched in 1998	Scheduled for launch in 1999
Germany	--	Launched in 1996	Launched in 1997
France	--	Launched in 1996	--
Spain	Launched in 1999	Launched in 1997	--
Sweden	Launched in 1999	Launched in 1997	Launched in 1997
Hong Kong	--	Launched in 1996	--
Republic of Korea	Scheduled for launch in 2001	Test broadcasting launched in 1996	--
Australia	Scheduled for launch before 2001	Launched in 1995	--

Source: MPT

II-11-3 Global alliances

Recent moves in the reorganization of telecommunications and broadcasting businesses

II-11

Trends abroad

1. Telecommunications business

A significant development in the market in 1998 was the announcement of an AT&T Corp.-British Telecommunications (BT) joint venture. It was brought about after MCI Communications Corp., due to sluggish business results in the regional market, decided to merge with WorldCom Inc. BT had initially planned to merge with MCI, but was forced to change its strategy, especially regarding Concert, a joint business with MCI.

As a result of its alliance with BT, AT&T will leave World Partners. Due to a series of such movements, it was decided that World Partners should be dis-

solved. Concert too was forced to change its plan to recruit other members.

2. Broadcasting business

In the world of broadcasting there has been an accelerating trend towards digitalization and multichannel services, as shown by the 1998 launch of digital terrestrial broadcasting in the U.K. and the U.S. Since both digitalization and expanding the number of channels require huge levels of investment, mergers, acquisitions and tie-ups among businesses are being carried out under the leadership of large multinational companies.

Fig. 1 Growth of global alliances in telecommunications

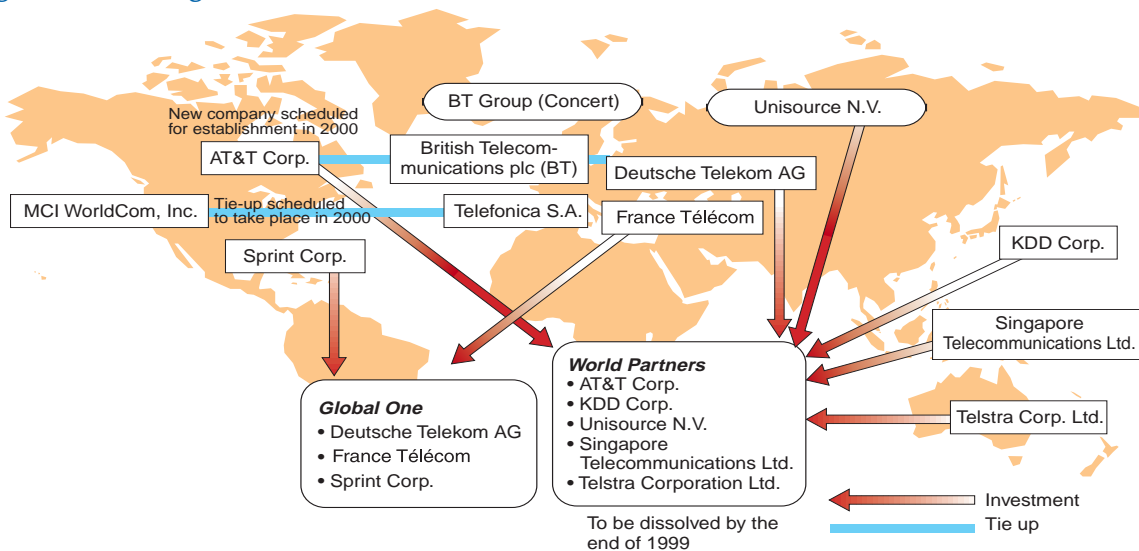
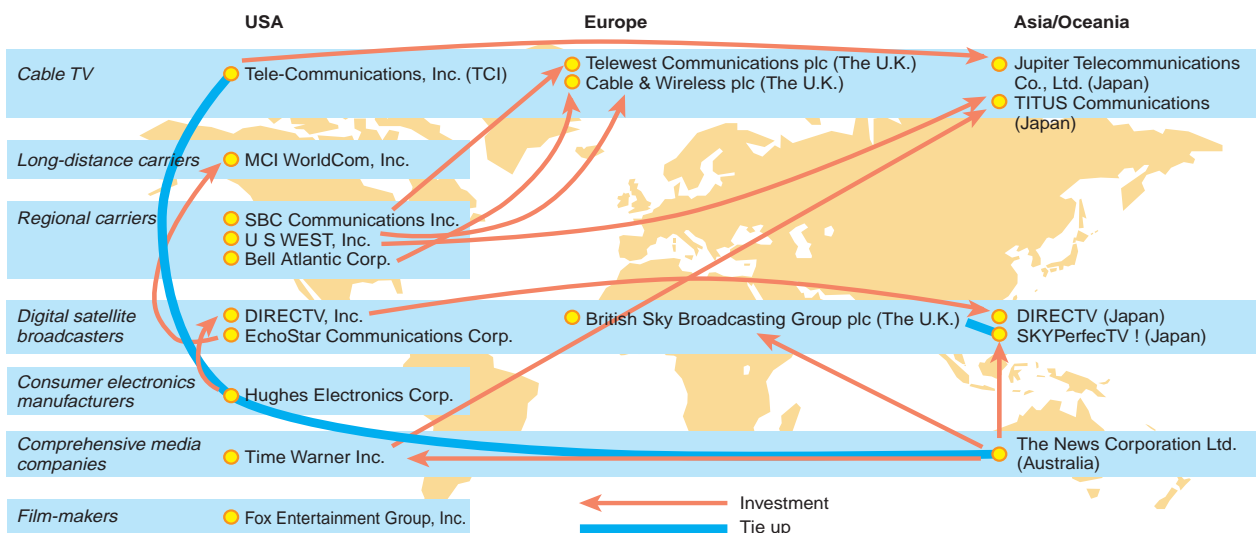


Fig. 2 Growth in global alliances in broadcasting



Source: MPT

Column 4 Frequency resources

Demand for radio frequencies rises with economic growth and advances in technology.

Economic growth and improved quality are often accompanied by growing demand for diversity and sophistication in the functions of radio communications.

In Japan, there has been a rapidly growing demand for the use of radio frequencies, and this is expected to be stimulated further by advances in frequency utilization technology. One such example is the recent development of wireless cards that enable information to be read or written without the card having to be inserted into any device. Such cards might be used, for example, at the entrances and exits of railway platforms.

Frequencies are allocated for various purposes, based on the propagation characteristics of radio waves in each frequency band (Table). Entities wishing to use radio waves must apply to the

Minister of Posts and Telecommunications for a license to operate radio stations, except in cases where they plan to use extremely weak antenna power. The availability of assignable frequencies is one factor in deciding whether to grant a license.

Taking into consideration trends in demand for the use of radio frequencies, as well as technological developments, MPT regularly determines what radio communications services within Japan can use which frequencies in each frequency band. The process is detailed in "Principles of Frequency Allocation," which also lists current allocations and is available from MPT or online at:

<http://www.mpt.go.jp/policyreports/japanese/misc/table9901-j.html>

Table Frequency, wavelength, name, characteristics and main services

Frequency	3 kHz	30 kHz	300 kHz	3 MHz (3,000 kHz)	30 MHz	300 MHz	3 GHz (3,000 MHz)	30 GHz	300 GHz	3 THz (3,000 GHz)	
Wavelength	100 km	10 km	1 km	100 m	10 m	1 m	10 cm	1 cm	1 mm	100 μm	
Name	VLF	LF	MF	HF	VHF	UHF ← Quasi-microwave	SHF ← Quasi-millimeter wave	EHF	Sub-millimeter wave	Light	
Propagation characteristics	Travel just above the ground. They can propagate over low mountains.			Reach the other side of the world, bouncing between the ionosphere.	In principle, propagate straight ahead; but for obstacles such as buildings and hills, they go around and continue advancing.	Propagate straight ahead just like light; but when raining, radio waves do not travel very far as rain drops and vapors absorb them.					
Usage methods	Transmitted in all directions						Aimed at a specific direction				
Information capacity	Small						Large				
Characteristics of radio equipment	Large-scale antennas and transmission facilities are required.			Simple and inexpensive receivers can be used.		For mobile communications, small antennas and transmission/receiving stations can be used. Suitable for transportable or mobile communications.		In many cases, parabolic antennas are used, and transmitting/receiving facilities used are relatively large.			
Main usage		<ul style="list-style-type: none"> Ship-aircraft radio beacon 	<ul style="list-style-type: none"> Maritime communications AM radio Ship-aircraft radio beacon Amateur radio 	<ul style="list-style-type: none"> Ship-aircraft communications International HF radio Amateur radio 	<ul style="list-style-type: none"> Radio paging FM radio (community radio) TV broadcasting Disaster prevention and emergency communications system for local governments Radio communications system for firefighting Police radio Simple radio-communications Air traffic control communications Amateur radio Cordless telephone 	<ul style="list-style-type: none"> Cellular/car phone PHS PHS-WLL MCA System Mobile communications for taxi TV broadcasting Mobile satellite communications Railway radiotelephone Police radio Simple radio communications Radar Amateur radio Personal radio Wireless LAN Cordless telephone Industrial Scientific Medical (ISM) device 	<ul style="list-style-type: none"> Microwave relay communications Studio-to-Studio Transmitter Link (STL) Satellite communications Satellite broadcasting Radar Radio astronomy/Space research Wireless LAN Fixed Wireless Access (FWA) Wireless card (e.g., ETC) 	<ul style="list-style-type: none"> Radio astronomy communications Satellite communications Simple radio station FWA Radar 			
	Bands in which most frequencies are already being used							Bands in which most frequencies are yet to be used			

Related site: Principles of Frequency Allocation (<http://www.mpt.go.jp/policyreports/japanese/misc/table9901-j.html>)