Section 1
Advances in Network Infrastructure

1. Advances in Network Infrastructure

(1) Broadband at the World's Highest Levels

The number of broadband subscribers (including FTTH, DSL, cable Internet, and wireless (such as FWA)) reached 14.95 million at the end of fiscal 2003 **(Figure 1-1-1)**. The number of DSL subscribers, who use special modems connected to telephone lines, was 11.20 million at the end of fiscal 2003 and is a driving force being the expansion of broadband services. The number of cable Internet subscribers, who use cable television networks to connect to the Internet, was 2.58 million at the end of fiscal 2003 and is increasing steadily. FTTH is a an ultra-high speed network that boasts communications speeds faster than DSL and cable Internet, and the number of subscribers at the end of fiscal 2003

was 1.14 million, a 3.7-fold increase from the 310,000 subscribers at the end of the previous year.

The number of broadband users at the end of 2003 is estimated to have been 26.07 million (a 33.4% increase over the previous year and a 20.4% penetration rate). Broadband users account for 33.7% of the total population of Internet users of 77.3 million. Thus, more than one in three Internet users access the Internet by broadband.

The percentage of households that use broadband to access the Internet from a home PC increased from 29.6% at the end of 2002 to 47.8% at the end of 2003, an increase of 18.2 points in just one year. A total of 61.7% of households use always-on Internet connections including broadband and always-on ISDN. In contrast, the percentage of households that use dial-up ISDN or telephone connections decreased from 56.1% to 38.4%, down 17.7 points from the previous year **(Figure 1-1-2)**.
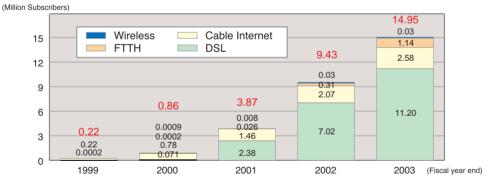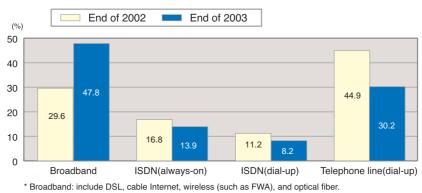
Figure 1-1-1 Number of Broadband Subscribers

(Million Subscribers)

Legend: Wireless, Cable Internet, FTTH, DSL

Fiscal year end	Total	Wireless	FTTH	Cable Internet	DSL
1999	0.22	0.0002			0.22
2000	0.86	0.0009	0.0002	0.78	0.071
2001	3.87	0.008	0.026	1.46	2.38
2002	9.43	0.03	0.31	2.07	7.02
2003	14.95	0.03	1.14	2.58	11.20

Figure 1-1-2 Internet Connection Methods from Home PCs

(%)

Legend: End of 2002, End of 2003

	End of 2002	End of 2003
Broadband	29.6	47.8
ISDN(always-on)	16.8	13.9
ISDN(dial-up)	11.2	8.2
Telephone line(dial-up)	44.9	30.2

* Broadband: include DSL, cable Internet, wireless (such as FWA), and optical fiber.

Source: Communications Usage Trend Survey, MPHPT

The continuing fall in broadband fees is one factor behind the rapid proliferation of broadband services. An international comparison of DSL and cable Internet fees converted to the cost per 100 kbps reveals that fees in Japan at the world's lowest levels **(Figure 1-1-3)**.

An international comparison of broadband penetration in 2002 shows that Japan is third in terms of the number of subscribers behind the United States (19.88 million subscribers) and the Republic of Korea (10.13 million subscribers). The Republic of Korea has the highest broadband penetration rate at 21.3%. Japan is in ninth place **(Figure 1-1-4)**.

(2) Development of Mobile Internet
(i) Increased use of the Internet from mobile phones

The number of mobile phone subscribers in Japan exceeded 80 million in January 2004, reaching 81.52 million at the end of fiscal 2003. Of those, 69.73 million were mobile phone Internet subscribers (i.e., subscribers to Internet service that use mobile phones) **(Figure 1-1-5)**.

(ii) Increase in 3G mobile phones and advanced functions

Standardization and development of systems for the practical application of third-generation (3G) mobile phones is advancing rapidly in Japan. In October 2001 the NTT DoCoMo Group introduced the world's first W-CDMA format 3G mobile phone, and the KDDI Group began CDMA 2000 services in April 2002 while J-Phone (currently Vodafone) began W-CDMA services in December 2002. The number of 3G mobile phone subscribers reached 16.69 million at the end of fiscal 2003 and continues to increase steadily **(Figure 1-1-6)**.

(iii) International Comparison of Mobile Internet Use

An international comparison of the percentage of mobile phone Internet subscribers of all mobile phone subscribers of leading carriers in various countries and territories reveals that Japan's rate of 89.5% is the world's highest followed by the Republic of Korea and China. Thus, Asia is a driving force behind the increase in mobile Internet use **(Figure 1-1-7)**.
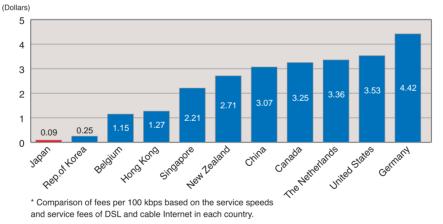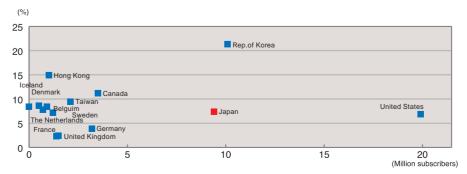
Figure 1-1-3 International Comparison of Broadband Fees (cost per 100 kbps; July 2003)

(Dollars)

Japan	Rep. of Korea	Belgium	Hong Kong	Singapore	New Zealand	China	Canada	The Netherlands	United States	Germany
0.09	0.25	1.15	1.27	2.21	2.71	3.07	3.25	3.36	3.53	4.42

* Comparison of fees per 100 kbps based on the service speeds and service fees of DSL and cable Internet in each country.
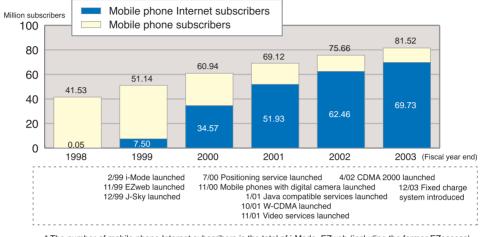
Produced from Birth of Broadband, ITU

Figure 1-1-4 International Comparison of Total Broadband Subscribers and Subscribers per 100 inhabitants (2002)
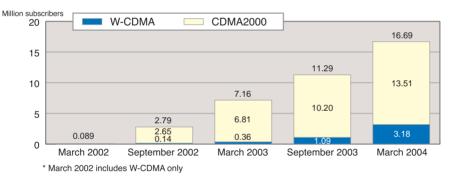

(%)

(Million subscribers)

Produced by the MPHPT based on Birth of Broadband, ITU

Figure 1-1-5 Number of Mobile Phone Subscribers and Number of Mobile Phone Internet Subscribers

Million subscribers

■ Mobile phone Internet subscribers
□ Mobile phone subscribers

Year	Mobile phone Internet subscribers	Total
1998	0.05	41.53
1999	7.50	51.14
2000	34.57	60.94
2001	51.93	69.12
2002	62.46	75.66
2003	69.73	81.52

(Fiscal year end)

2/99 i-Mode launched
11/99 EZweb launched
12/99 J-Sky launched

7/00 Positioning service launched
11/00 Mobile phones with digital camera launched
1/01 Java compatible services launched
10/01 W-CDMA launched
11/01 Video services launched

4/02 CDMA 2000 launched
12/03 Fixed charge system introduced

* The number of mobile phone Internet subscribers is the total of i-Mode, EZweb (including the former EZaccess), and Vodafone Live! (including the former J-Sky) subscribers.

Figure 1-1-6 Number of 3G Mobile Phone Subscribers

Million subscribers

■ W-CDMA   □ CDMA2000

Date	W-CDMA	CDMA2000	Total
March 2002	0.089		0.089
September 2002	0.14	2.65	2.79
March 2003	0.36	6.81	7.16
September 2003	1.09	10.20	11.29
March 2004	3.18	13.51	16.69

* March 2002 includes W-CDMA only

Produced from Telecommunications Carriers Association documents
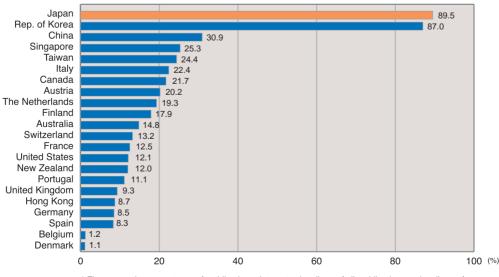
Figure 1-1-7 Mobile Phone Penetration Rates in Major Countries and Territories (mobile Internet subscribers of all mobile phone subscribers) (end of September 2003)

Country/Territory	(%)
Japan	89.5
Rep. of Korea	87.0
China	30.9
Singapore	25.3
Taiwan	24.4
Italy	22.4
Canada	21.7
Austria	20.2
The Netherlands	19.3
Finland	17.9
Australia	14.8
Switzerland	13.2
France	12.5
United States	12.1
New Zealand	12.0
Portugal	11.1
United Kingdom	9.3
Hong Kong	8.7
Germany	8.5
Spain	8.3
Belgium	1.2
Denmark	1.1

* Figures are the percentages of mobile phone Internet subscribers of all mobile phone subscribers of leading carriers in each country and territory.

Produced from "3G Mobile"

(3) Increases in IP Telephone and Hot Spots

In conjunction with the increased use of broadband, use of IP telephone has also been increasing, and 7.3% of households were using IP telephone at the end of 2003. Also, 11.1% of businesses were using IP telephone at the end of 2003 and 42.7% planned to introduce it.
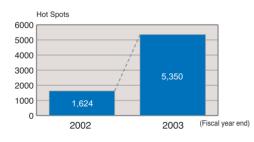
The number of high-speed wireless access points (hot spots) in public places increased from 1,624 at the end of fiscal 2002 to 5,350 at the end of fiscal 2003 **(Figure 1-1-8)**. Use of hot spots by Internet users increased to 9.5% at the end of 2003, up 0.7 points from the end of 2002 **(Figure 1-1-9)**.

(4) Digitization of Broadcasting

Terrestrial digital television broadcasting began in three major metropolitan areas of Tokyo, Nagoya and Osaka on December 1, 2003 **(figure 1-1-10)**. With this start, digital broadcasts are available in all broadcasting media including terrestrial, satellite, and cable television broadcasting. The shift to digital is equal to the change from black and white to color. With the advent of digital broadcasting, in addition to the existing passive viewing style, viewing styles that encourage more action by viewers may also be realized.

The shift from analog to digital broadcasting is scheduled from completion by 2011 with the exception of terrestrial radio broadcasting. The shift to digital is already essentially complete for communications satellite broadcasting. Analog high-definition broadcasting
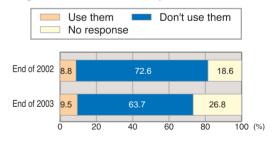
satellite (BS) broadcasting is scheduled for termination in 2007 while other BS broadcasting (NHK-1, NHK-2, and Wowow) will end in 2011. A goal of converting virtually all cable television broadcasting to digital by 2010 has also been set **(Figure 1-1-11)**.

Terrestrial digital television broadcasting in Japan offer tremendous benefits to users including high-definition broadcasting and the provision of stable services even while viewers are in transit or using mobile terminals, and have outstanding features compared to other countries **(Figures 1-1-12 and 1-1-13)**. The expansion of terrestrial digital television broadcasting will make it possible for viewers to access high-definition, high-quality programming at any time from any location and is expected to enhance the competitiveness of Japanese businesses through the development of household appliances with advanced functions.

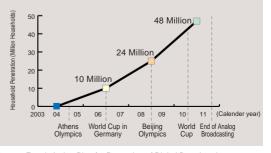**(5) Development of e-Government and e-Local Government**

With regard to performing administrative procedures online, the Law Concerning the Use of Information and Telecommunications Technology on Administrative Procedures came into force in February 2003, and the development of systems including a government public key infrastructure (GPKI) and a general-purpose reception system was completed by the end of fiscal 2003. The development of an environment for performing administrative functions online is basically complete including the Basic Resident Registers Network System

Figure 1-1-8 Change in Number of Hot Spots

Source: Survey of the Current Status and Issues of Networks

Figure 1-1-9 Use of Hot Spots

Source: Communications Usage Trend Survey, MPHPT

Figure 1-1-10 The Launch of Terrestrial Digital Television Broadcasting in Tokyo

(The ceremony held at the launch of terrestrial digital television broadcasting)

Figure 1-1-11 Goal for Penetration of Terrestrial Digital Television Broadcasting in Households

Source: Fourth Action Plan for Promotion of Digital Broadcasting, National Conference for Promotion of Terrestrial Digital Broadcasting

becoming fully operational in August of 2003 and the start of a public personal certification system that operates online, as well as electronic payment services for payment of taxes and various administrative fees in January 2004. In addition, during fiscal 2003, all local government bodies began participating in the Local Government Wide Area Network (LGWAN).

Using this environment, the online filing of most applications and notifications handled by central government agencies became possible by the end of fiscal 2003 including the start of electronic filing of tax returns to the Nagoya Regional Taxation Bureau (covering Gifu, Shizuoka, Aichi, and Mie Prefectures).

In addition, the MPHPT revised the "Policy Concerning the Promotion of Computerization Measures by Local Governmental Bodies in Response to the IT Revolution" (adopted August 2000) and the "e-Government and e-Local Government Promotion Program" (adopted October 2001) and announced the "e-Local Government Promotion Guideline" in August 2003 as a reference for independent and positive actions supporting the realization of e-local government, taking into careful consideration conditions in local governmental bodies as well as differences in their

scale and abilities.

2. Technology Development and Standardization for Enhancing International Competitiveness

For users to access diverse services on safe and secure networks, activities are expected to promote research and development and testing that will contribute to the construction of ubiquitous networks such as the development of terminals that even general users not familiar with PC operation can use easily by making use of Japan's experience in home appliance operability and reliability, areas in which Japan excels.

In order to distribute broadly the results of R&D, enhance international competitiveness, and improve people's lifestyles, it is essential that measures be taken to promote the integration of R&D and standardization and the distribution around the world of technologies developed in Japan including standardization activities that protect intellectual property rights from the earliest stages of R&D.

Figure 1-1-12 Benefits to Viewers of Terrestrial Digital Television Broadcasting

Viewers can enjoy clear pictures in detailed, high-definition and CD-quality sound that provides an on-the-scene experience.
Users can acquire a wide range of information not previously available and access diverse and highly convenient services such as interactive functions linked to the Internet.
Users can view broadcasts on mobile phones and PDAs and use services stably even while in transit.
Digitalization will substantially increase the volume of information that can be broadcast, making enhanced credit and explanatory services possible as well as viewer-friendly services such as the function to adjust the pace of speech when it is too fast for easy comprehension.
Users will be able to select programs using services with electronic programming guides (EPG) and watch programs whenever they want using server-type broadcast services.

Produced based on the Fourth Action Plan for Promotion of Digital Broadcasting,
National Conference for Promotion of Terrestrial Digital Broadcasting

Figure 1-1-13 International Comparison of Terrestrial Digital Television Broadcasting

	Europe (DVB-T Format)	Japan (ISDB-T Format)	United States (ATSC Format)
Can be received while in transit	Under development.	Suitable. Services to begin in 2005.	× Not suitable.
High-Definition Broadcasts	× Not provided.	The policy is for at least 50% of programming to be broadcast in high- definition (NHK's policy is 80%).	There is little high-definition programming available.
Interactive Functions	Interactive functions are available in some countries.	Interactive functions with dial-up and broadband are standard features.	Under consideration.

3. Evolving Towards Ubiquitous Networks

Japan has the world's lowest-cost and fastest broadband networks, and the number of broadband users is increasing steadily. The use of advanced services from Internet-compatible terminals and camera-equipped devices including mobile phones is increasing, and the creation of hot spots is leading the to development of an environment in which users can connect to the Internet at any time from anywhere. In this way, networks are shifting to broadband and mobile access.

With respect to terminals, with the start of terrestrial digital television broadcasts, it is expected that high-quality television image will spread throughout households and that televisions will become a means of accessing the Internet in forms such as broadcast program that is linked to the Internet and Internet access from a television screen. In addition, mobile terminals that can receive terrestrial digital television broadcasts are expected, and an environment under which such broadcasts can be received anywhere is being developed.

Moreover, the development of intelligent home appliances will make it possible for home appliances, which until now have all been used independently, to provide convenient network services such as links to the Internet and the ability to be operated from outside the home. At the same time, links between devices in the home such as home appliances, PCs, and mobile phones will lead to energy conservation and higher efficiency, safety, and improved operability. The practical application of RFID tags that can access networks will make possible integrated management that covers entire product lifecycles in areas such as increasing the efficiency of manufacturing, distribution, and inventory management, performing product adjustments, managing product histories, and preventing loss and theft as well as in such areas as distribution, sales, use, maintenance, and recycling.

In the future, we will see the development of seamless networks that can ensure the quality of communications and high security through the shift to IPv6 (Internet Protocol version 6) and other measures, and the connection of various types of devices to networks will allow the determination of the status of "people" and "things" that are linked to networks in real time and the provision of new and diverse services.

These networks, applications, and terminals will create a virtuous cycle that will lead towards the realization of ubiquitous networks that allow anyone to connect to networks at any time from anywhere to acquire and exchange information freely **(Figure 1-1-14)**.
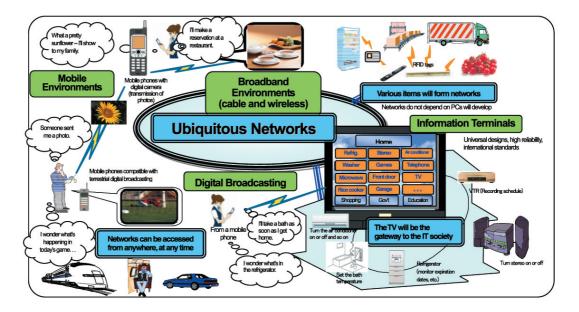
Figure 1-1-14 Image of Ubiquitous Networks

Source: Survey of the Current Status and Issues of Networks