

# **Special Article on IMT-2000 Services (1)**

## **— Launch of FOMA, the Pioneer of the New Mobile Age —**

### **Service Overview**

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*On May 30, 2001, DoCoMo launched the world's first IMT-2000 service "FOMA" on an introductory basis. IMT-2000 is a third-generation mobile communications system which makes the full-fledged mobile multimedia possible.*

*This article reviews the efforts made by rolling out extensive mobile multimedia services, overviews IMT-2000 as the efficient steps to such services, and discusses the business development.*

## 1. Introduction

On May 30, 2001, DoCoMo launched the introductory service of an International Mobile Telecommunications-2000 (IMT-2000) system under service name FOMA<sup>★1</sup>, as the first in the world to introduce a third-generation mobile communications service. The introduction of IMT-2000 has kickstarted the mobile multimedia age in full, and further expansion of the horizons of mobile communications are expected.

## 2. Current Status of Mobile Communications

In Japan, the first cellular phone service was in the form of a car phone as shown in **Figure 1**. This first-generation, analog system was introduced in 1979. The second generation, digital system was commercialized in 1993. Since then, mobile phone subscribers have expanded rapidly in number due to the introduction of mobile terminal sell-off schemes and the reduction of fees. In March 2000, the number of mobile phone subscribers exceeded the fixed phone subscribers. Despite such dramatic growth of the mobile communications market centering on speech communications, DoCoMo's efforts have not been limit-

ed to the reinforcement of the speech communications, which has been the principal service for years, simply because of the fact that the subscriber population is limited in number. As a basic strategy for further growth, DoCoMo has been endeavoring to expand traffic from speech communications to non-speech communications. The first step in that direction was i-mode, which is a service that merges mobile phones and the Internet. i-mode is contributing significantly towards the cultivation of the mobile communications market by increasing the number of subscribers to the service, which exceeded 24 million as of May 2001. IMT-2000 is the third-generation mobile communications system, which emerged to facilitate the progress of mobile multimedia even further.

## 3. Progress of Mobile Multimedia

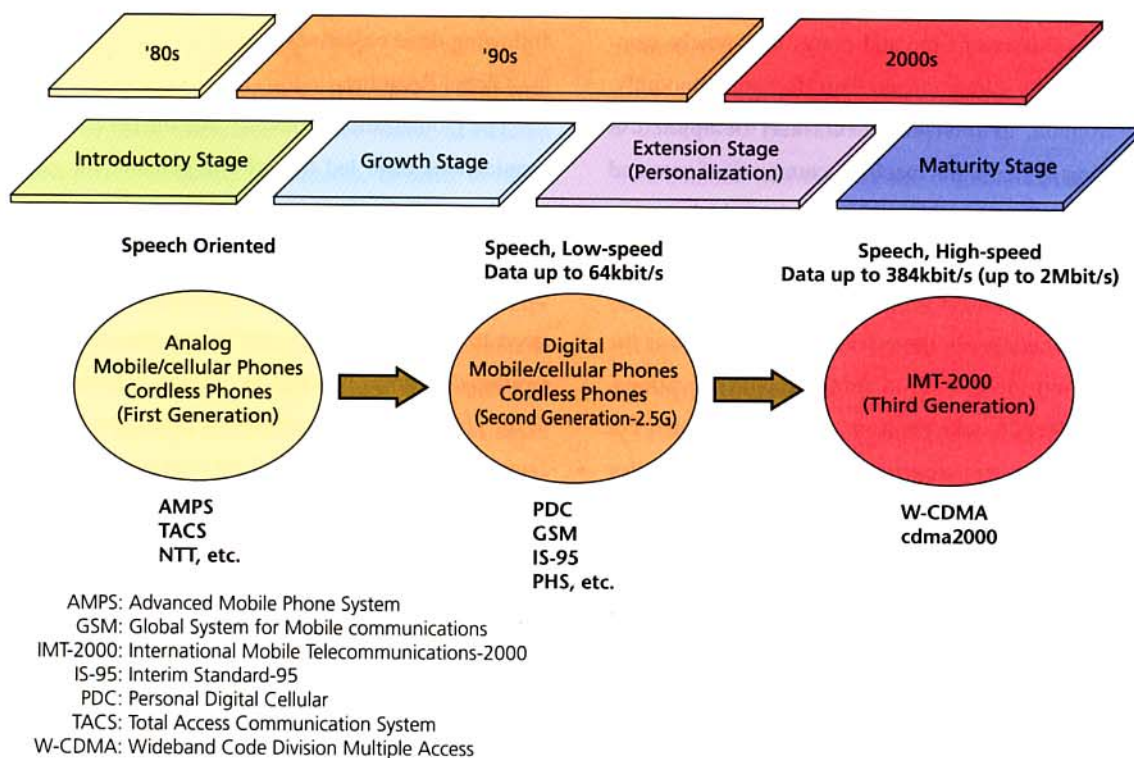
DoCoMo implements mobile multimedia services based on the following three basic policies:

- (1) Promote mobile Internet, as represented by i-mode;
- (2) Approach to the company-oriented business market; and
- (3) Develop a wide range of new services based on IMT-2000.

**Figure 2** illustrates an example of mobile multimedia services in the future, including IMT-2000.

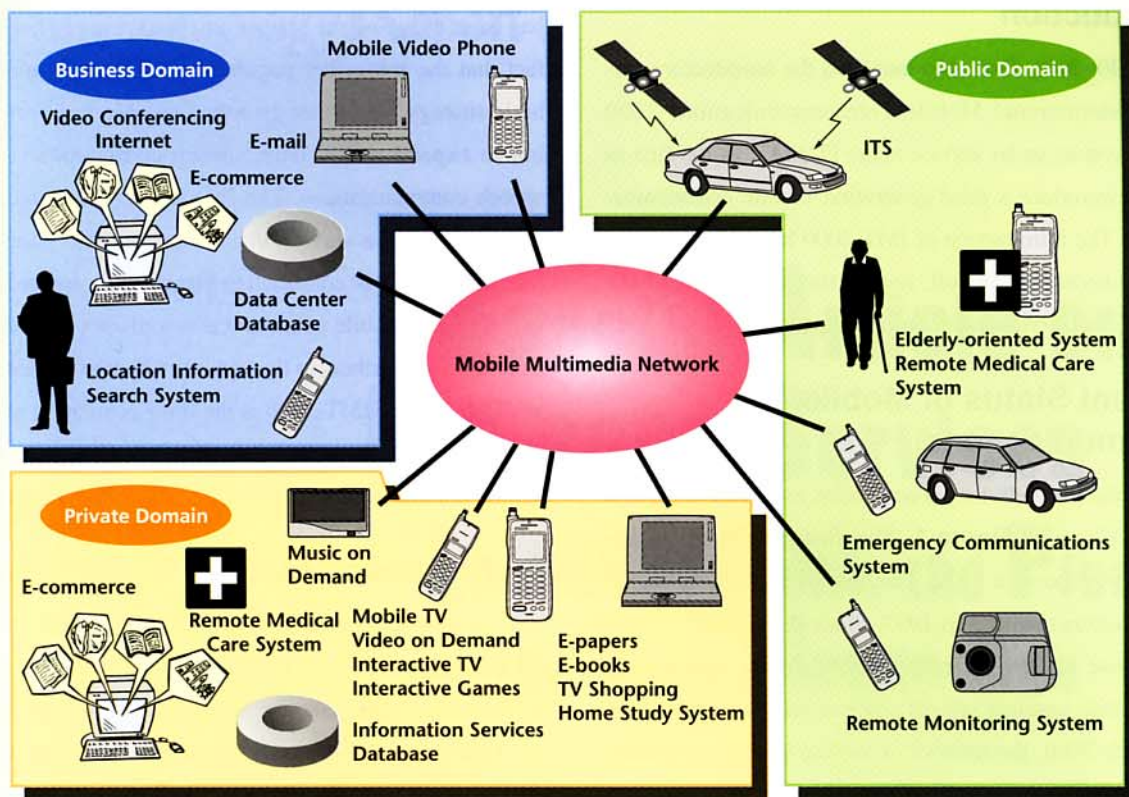
In the business domain, which consists of progressive mobile communications users, the focus of users is expected to shift

★1 FOMA: The brand name of DoCoMo's third-generation mobile communications system (IMT-2000). The abbreviation of Freedom Of Mobile multimedia Access.



**Figure 1 Scenario for Mobile Communications Evolution**





ITS: Intelligent Transport Systems

**Figure 2 Example of Mobile Multimedia Services**

from conventional text data to video data. It is hoped that the services will enable users to acquire a wide range of data in large volumes, regardless of time and place, in a timely manner, and enable them to communicate their decisions smoothly. In the public domain, mobile multimedia may be applied to remote monitoring systems for machine communications, and Intelligent Transport Systems (ITS) which assist vehicle operation and safe driving, as well as emergency communications that take advantage of wireless communications' sustained reliability in disaster situations. In the private domain, which is the driving force behind the growth of mobile communications, developments are likely to take the form of mobile Internet. For example, video phones are expected to become available for video communications, and video mail for e-mail services. As for distribution services, video distribution is believed to take off on a full scale, in addition to, needless to say, music distribution.

#### 4. Objectives of IMT-2000

The term "IMT-2000" is derived from the fact that the system was planned to start the service around the year 2000, uses

the 2000MHz frequency band, and achieves a maximum transmission speed of 2000kbit/s, that is, 2Mbit/s. IMT-2000 has the following three objectives.

##### (1) Global Roaming

The globalization of society and the personalization of communications have led to a strong demand for global roaming, which is a technology that enables the user to communicate wherever he/she is in the world, without swapping his/her mobile terminal. Owing to personalized communications, users need to access various types of services even when they are overseas, in areas covered by foreign communication carriers. With global roaming, network services provided by the local communication carrier will be available to the user even if he/she crosses national borders.

##### (2) Mobile Multimedia

IMT-2000 enables high-speed, and high-quality transmission of multimedia signals, and thereby fulfills the requirements for various types of mobile multimedia. It aims to achieve a maximum transmission speed of 384kbit/s outdoors and 2Mbit/s indoors.

IMT-2000 aims to build an internationally standardized

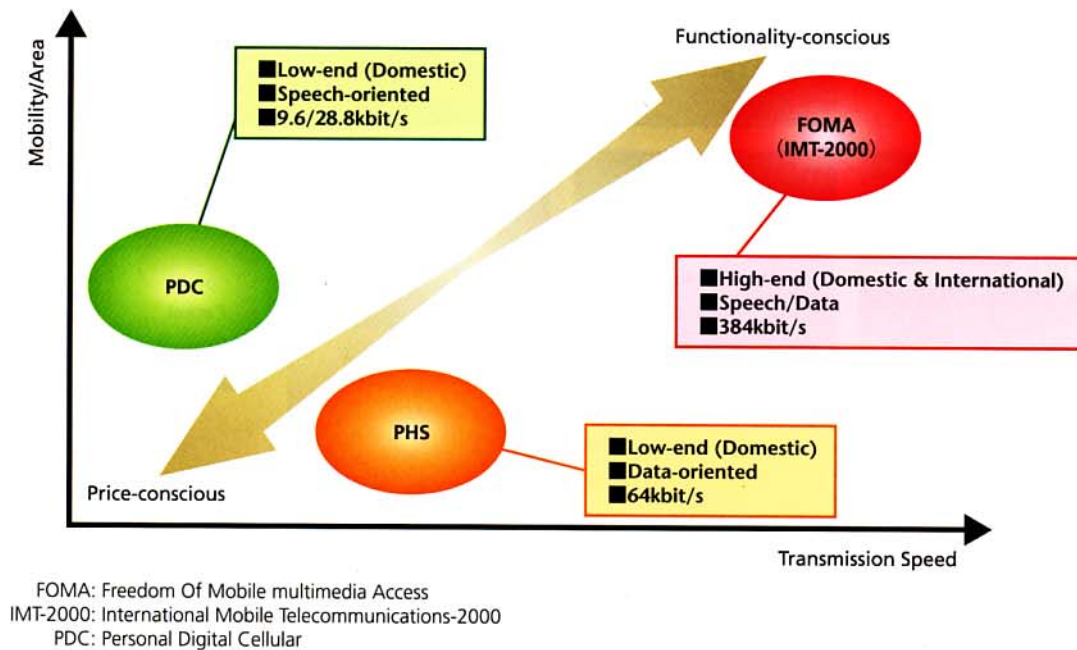


Figure 3 Positioning of FOMA Service

radio interface and a mobile communications system which is able to provide services that are no inferior to those available in fixed communications in terms of range and quality. It also attempts to achieve the same quality as fixed networks, and at the same time, double the system capacity of Personal Digital Cellular (PDC), which is the second-generation mobile communications system.

### (3) Personal Services

In the future, mobile communications will have to deal with a larger number of subscribers and heavier traffic associated with the developments in mobile multimedia. In order to make "any type of service available to any mobile user", costs will have to be reduced by maximizing the efficiency of bandwidth usage. Technologies to minimize the size and power consumption of mobile terminals will be indispensable, so as to enable individuals to carry them around, attach them to dogs, cats and other pets, and paste them on parcels. In addition to these, small base stations will have to be installed to ensure seamless coverage based on micro radio zones.

## 5. Strategic Positioning of IMT-2000

IMT-2000 will play a central part in radically expanding the mobile multimedia market, harnessing its high-speed, large-capacity data transmission properties to the maximum extent. Mobile multimedia services will be further enhanced through IMT-2000 services and various types of services provided by

FOMA, such as the advanced i-mode, video distribution, music distribution, video phone, etc. Based on these services, FOMA aims to add greater value to mobile communications services, improve user-friendliness, and roll out operations targeting users who require high-speed data communications and high functionality, as illustrated in **Figure 3**. FOMA is in fact a service designed to satisfy users whose needs are shifting "from volume to value".

## 6. Overview of FOMA

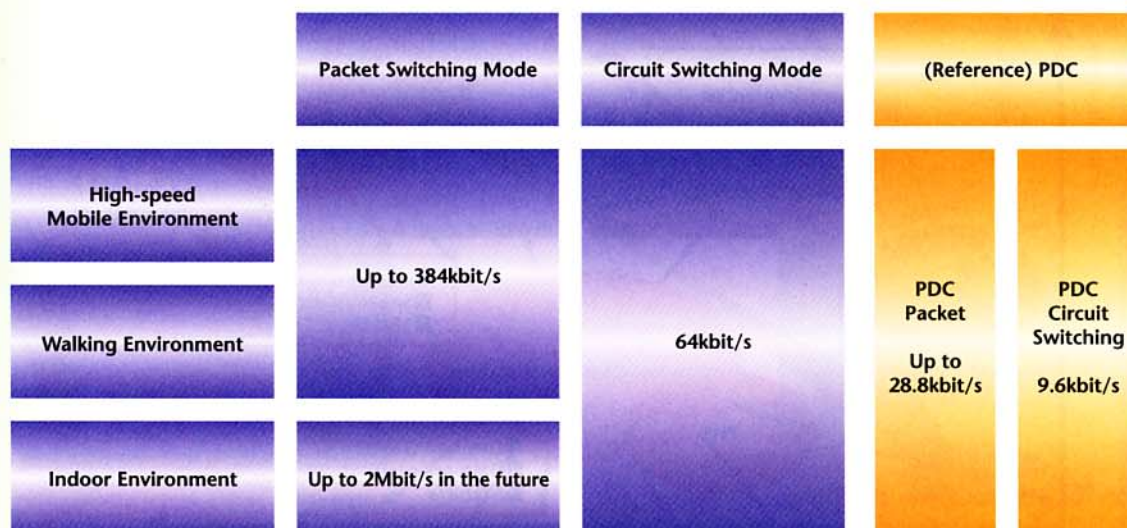
First, we will discuss the communication format and the transmission speed.

Compared to PDC, the second-generation mobile communications system, FOMA is much faster in circuit switching and packet switching, and is able to provide a wide range of bearer services (**Figure 4**).

For circuit switching, FOMA applies Adaptive Multi Rate (AMR; 12.2kbit/s) as the COder DECoder (CODEC) for speech communications, to achieve the same sound quality as in fixed networks. FOMA adopts an unrestricted digital bearer for data communications with Integrated Service Digital Network (ISDN) and mobile terminals, and an AV bearer for new video phone and video communication services to enable 64kbit/s communications.

For packet switching, on the other hand, FOMA provides a best-effort service with a maximum transmission speed of





PDC: Personal Digital Cellular

**Figure 4 FOMA Communications System**

64kbit/s uplink and 384kbit/s downlink. FOMA enables connection with Local Area Networks (LAN) and Internet Service Providers (ISP) through leased lines, in addition to connection with i-mode service. DoCoMo is working on providing services with a maximum speed of 2Mbit/s in an indoor environment in the years to come.

FOMA also offers a multi-access service, which enables subscribers to use speech communications and packet communications at the same time. Subscribers can use i-mode and exchange data during their phonecalls.

As for the specific types of services, we will only give a brief description of FOMA applications and mobile terminals as the details are described in the next article, "Services and Terminals".

Key applications in FOMA include enhanced i-mode services, video phone services, video distribution and other information services. In order to provide such services, mobile terminals (FOMA terminals) are not limited to standard models: terminals dedicated to data communications are also available, in the form of Personal Computer Memory Card International Association (PCMCIA) cards with visual functions which enables video exchange. In addition, a wide range of terminals are due to be released, including terminals dedicated to music distribution services, which shall further expand the line-up of FOMA terminals.

FOMA terminals newly apply the User Identity Module (UIM) to achieve user mobility. UIM is an IC card that memorizes the phone number, the terminal number and other user

information. Depending on the usage environment, users can swap mobile phones without changing the phone number, as long as the right UIM card is inserted.

## 7. FOMA Business Implementation

This section discusses FOMA's service area, number of subscribers, capital investment and other business aspects. **Figure 5** illustrates the future business prospects of FOMA.

### 7.1 Expansion of Service Area

DoCoMo intends to expand FOMA's service area gradually by targeting PDC service areas. As of the end of May 2001, FOMA was available on an introductory basis in 23 wards of Tokyo, and some parts of Yokohama City and Kawasaki City. DoCoMo is planning a full expansion of the service area considering the multimedia demand while ensuring the service quality. By October 2001, FOMA's coverage should be 30km round in the Tokyo metropolitan area (roughly the area inside Route 16), and by the end of 2001, the service area should accommodate Osaka and Nagoya regions. By the spring of 2002, FOMA should be able to cover all major cities nationwide, and by March 2004, it should have a coverage ratio equivalent to the population of the existing PDC service areas.

### 7.2 Subscription Prospects

FOMA subscribers are expected to be consisted mainly of the experienced data communicators in PDC system, considering its mobile multimedia service features and the fact that the

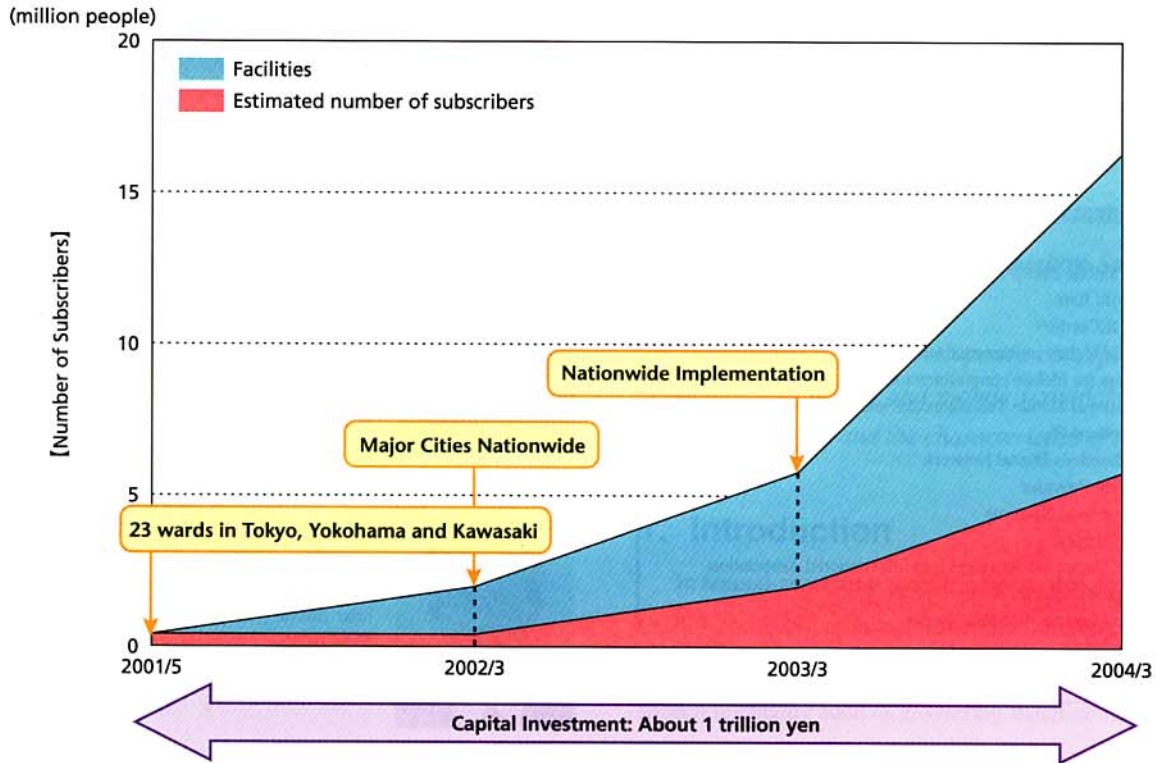


Figure 5 Introduction and Implementation Schedule

diffusion ratio of mobile communications has exceeded 50% of the whole. Since the service area will be limited in the introductory stages, the main target of FOMA would be the corporative demand for Internet/Intranet access based on high-speed data communications. In regard to the consumer demand, subscriber coverage should grow in line with the expansion of the service area and the improvement of the service, led by heavy i-mode users who are sensitive to new multimedia services.

### 7.3 Capital Investment Prospects

FOMA requires the establishment of a new network which consists of radio stations and switching facilities adapted to W-CDMA. DoCoMo has already spent 160 billion yen in capital investment for the launching of the FOMA service in the Tokyo metropolitan area in 2001, by the end of FY2001. DoCoMo is expecting to spend about 1 trillion yen in capital investment throughout the entire group in three-year period following 2001, to expand the coverage and to secure enough network capacity to meet multimedia demand.

### 7.4 Implementation of Business in the Medium Term

For rolling out the FOMA business, there are two management factors that have a crucial impact on finances, namely,

mobile multimedia and the pace of transition from PDC.

Firstly, service applications and contents will have to be enhanced to stimulate the demand for full-fledged multimedia, following the introduction of FOMA. It will be indispensable to cultivate “killer applications”, form an alliance with prominent contents providers, provide attractive mobile terminals and take other measures to promote the use of mobile multimedia, so as to increase non-speech traffic and raise revenue thereby.

Secondly, the rate at which users migrate from PDC to FOMA relative to the rise in mobile multimedia demand will have a strong relationship with finances. DoCoMo might have to face a heavier financial burden if user migration to FOMA rapidly takes place before the demand for mobile multimedia matures, opportunity losses led by unrecovery of the capital investment in PDC will occur, and additional capital investment will be required to cope with the dramatic increase in FOMA subscribers who primarily use speech telephony. On the other hand, if user migration to FOMA turns out to be too slow despite the rapid establishment of the mobile multimedia market, DoCoMo will not be able to gain revenue from increased non-speech traffic.

DoCoMo will roll out the business from a medium-term perspective, in consideration of these factors.



## 8. Conclusion

This article reviewed IMT-2000 services, provided a rough description of FOMA and explained how the business will be implemented. FOMA service was launched very recently on an

introductory basis, and the expansion of its coverage will take place after autumn this year. As FOMA is DoCoMo's key business which is expected to serve as the driving force for the company's growth, it is hoped that the service will instigate the expansion of the mobile multimedia market.

### GLOSSARY

AMPS: Advanced Mobile Phone System  
AMR: Adaptive Multi Rate  
CODEC: COder DECOder  
FOMA: Freedom Of Mobile multimedia Access  
GSM: Global System for Mobile communications  
IMT-2000: International Mobile Telecommunications-2000  
IS-95: Interim Standard-95  
ISDN: Integrated Services Digital Network  
ISP: Internet Service Provider  
ITS: Intelligent Transport Systems  
LAN: Local Area Network  
PCMCIA: Personal Computer Memory Card International Association  
PDC: Personal Digital Cellular  
TACS: Total Access Communication System  
UIM: User Identity Module  
W-CDMA: Wideband Code Division Multiple Access