

FOMA Technology / Services

Overview

3G FOMA (Freedom for Mobile Multimedia Access) service provided by NTT Docomo is an advanced mobile communications service based on W-CDMA (Wideband Code Division Multiple Access) technology. FOMA services were launched in 2001 as world's first 3G mobile service based on W-CDMA. It currently boasts 3 million subscribers and claim addition of 1 million subscribers in last two months. NTT Docomo currently has 48 million customers and their i-mode service (2.5 G service) that allows downloading ringer tones, music etc has about 40 million customers. FOMA service charges customers from 3900 yen to 15000 yen that is approximately \$39 to \$150 in US dollars.

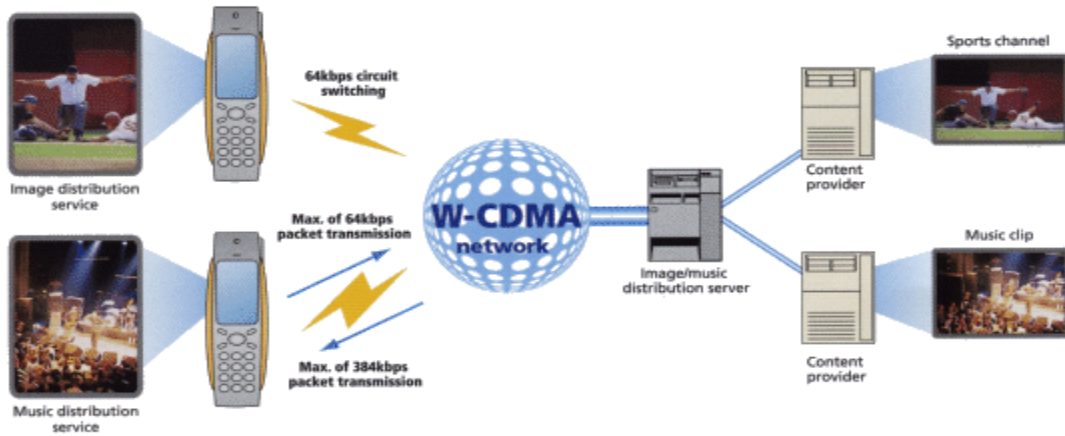
FOMA aims to realize worldwide a mobile communication service similar to Japan. Apart from advanced data services, it offers higher voice quality than conventional system and is more resistant to interference and noise.

The new service provides fast speed access up to 384 kbps on the downlink and 64 kbps on the uplink. This is categorized as 3G service apart from other services. With these data rates, new multimedia services / applications are enabled that are not practical in 2.5 G systems. Here are the new features enabled with these data services / application that do not exist in current 2.5G services.

- Video Phone service that would allow face-to-face communication between subscribers.
- Integration of voice and data services that would allow user to transmit and receive data during voice phone calls.
- Allows for subscribers to receive streaming video to enable services such as surveillance and remote monitoring. Also, streaming content such as movie previews, sports and other programs.
- Other applications include distance learning, remote medical treatment, and live monitoring services for homes, airports, and day-care centers.

Here are the existing services on 2.5 G that are enhanced using FOMA.

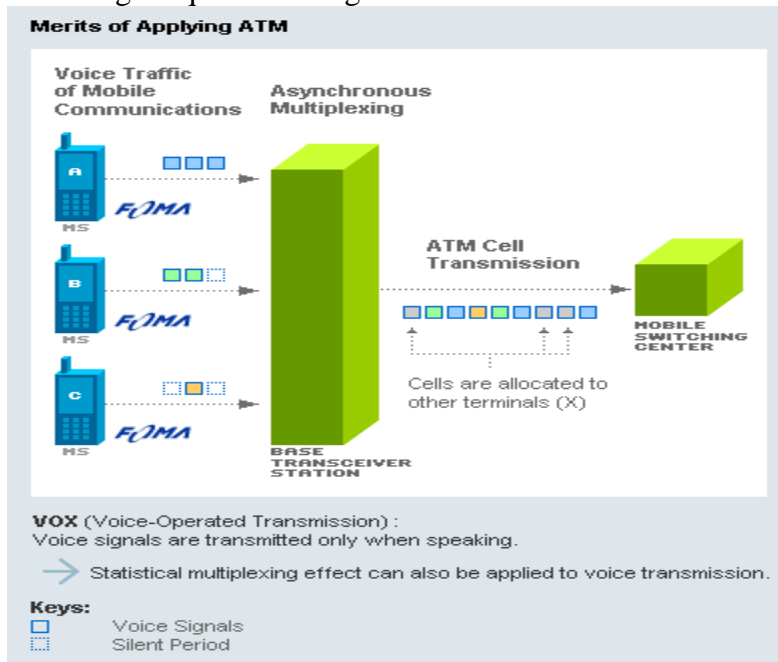
- Greater data speed would allow faster services for receiving emails, downloading ringer tones , Wallpapers
- Higher voice quality
- Faster browsing through the internet.
- Secure transactions over mobile enabling SSL service for e-commerce, m-commerce etc.



Involved Technologies

FOMA Technology uses W-CDMA that was invented by NTT DoCoMo and is standardized by ITU (International Telecommunications Union). W-CDMA uses spread spectrum technology in the 2GH band.

With packet data transfer speeds of 64kbps to 384kbps, NTT DoCoMo's 3G FOMA service supports a variety of applications including; Internet access, e-mail, file transfer, remote log-in, and Internet phone applications. Also available are ISDN-type services that function on a streamed basis, effectively using nx64kbps channels and supporting applications such as telephony, video-conferencing and Group 4 faxing. High-quality voice services at up to 12.2kbps are also supported. These attractive services utilize the following unique technologies.



Completely different from 1G and 2G networks, NTT DoCOMo's 3G network utilizes ATM technology that manages packet switching and circuit switching on the same network node, enabling use of various traffic types for true multimedia connectivity. Also

supported is the use of asymmetric communications with differing characteristics for the up-link and down link, possible because ATM can handle these resources separately. Moreover, ATM makes possible flexible connection services and both point-to-point and point-to multi-point connections.

WCDMA uses Spread Spectrum to transmit radio signals over wider frequency band than that used by conventional mobile phone systems. It allows Multi-rate technology suitable communication speed and transmission channel for data based on its type and size.

Potential Bottlenecks

FOMA's variant of the W-CDMA technology is currently incompatible with standard UMTS, including Vodafone Japan's 3G service, and hence does not provide global roaming.

KDDI CDMA 2000 1x Technology offered by KDDI uses evolutionary approach and has data rate of 144 kbps. Since it is backwards compatible with existing wireless customers, it attracted lot of customers where W-CDMA is not backwards compatible.

Due to the CDMA technology, there is graceful degradation of quality and bit-rate as the number of users increase. This is problematic in the crowded areas where the quality degradation is experienced by all the users instead of 2 G / 2.5 G systems where only few users experience the bottlenecks such as dropped calls etc.

Another bottleneck is the ROI (Return on Investment). Licenses to 3G spectrum are very expensive and with the infrastructure involved, it would require significant cost to setup these services and return on them should be substantial. This would imply for it to be cost effective it would require lot of subscribers or high cost plans. The high cost of the plan would discourage subscribers so this is a catch-22 situation.

With 64 kbps of uplink and 384 kbps link, the services such video phone and MMS application are quite feasible. However, it might not be suitable for applications such as telecommuting via broadband or broadband communications. Since ATM communication is used on the uplink, there is a dependency on the gateway to translate any IP communication. As the world is becoming more IP based and 3GPP recommends IP communication, this would introduce another layer of infrastructure for subscriber communication however author feels that ATM saves in protocol overhead as opposed to IP communications.

Even though the services are offered on the portable devices, from usability perspective the current drain is a big issue. With data services being offered on high-tier phones, they are equipped with cameras, Color displays and network services, the standby times and talk times becomes considerably smaller. This affects the expectations of certain customers who require more battery life.

Desirable Features

Enabling one-to-one video phone calls is a breakthrough application as it would allow users to communicate better. Also, video conferencing calls up to 8 users is desirable in the work-place or home scenarios.

FOMA uses W-CDMA that does efficient use of the spectrum as opposed to CDMA 2000 1X offered by KDDI as a competitor.

Faster download of Video emails and MMS messages is a desirable. Ability to surf the web at higher speed in mobility is very desirable as current data rates need more to be desired. Potential applications could be Wireless Gaming networks and Internet based applications that are enhanced by mobility.

Service integration such as joint audio and data services is very convenient as it would enable user level multi-tasking such as downloading files during voice calls. Current 2.5 G networks do not allow such features. Joint Video and Audio communication allows service integration such as downloading files during phones whereas phones today can function in one interface

FOMA provides access to streaming content from either internet or service provider and this is quite desirable as user gets access to music, movies and sports events. For streaming, the real-time constraints are less stringent compared to Video Conferencing, Client could deploy buffering that would add to startup delay and rest of the session is continuous expected to be continuous. The data rate of 384 kbps on the downlink is more than reasonable streaming content especially on the resolution that are provided in the handsets. This also allows applications such as distance learning, remote monitoring, surveillance, remote medical care etc.

Alternate Technologies for improvising the product

The data rates offered still are lower than what is provided in WLAN (Wireless LAN) that allow total bandwidth upto 1 – 56 mbps depending on which version of 802.11 is being used. Despite of bandwidth sharing between users, the data rate is quite high compared to W-CDMA. Since CDMA technology is interference limited and this is a problem in crowded areas such as Airports, office areas, the WLAN network could be leveraged. The WLAN uses a different spectrum and due to short range, it is possible to support high data rates.

KDDI and NTT DoCOMo are racing to offer the WLAN technology together with W-CDMA and CDMA-2000 1X on the same handset.

The wireless Broadband technology also known as 802.16 is interesting as it would offer better data rates than FOMA service and quite useful for application such as mobile telecommuting.