

FOMA Service Overseas Demonstration Function

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We have developed a demonstration environment that allows people in overseas locations to experience the FOMA services such as i-mode on a trial basis for the purpose of advertising the advanced FOMA and i-mode technologies to the world.

1. Introduction

We have developed a function that can be used to demonstrate the Freedom Of Mobile multimedia Access (FOMA) services in overseas locations. This function allows provision of the same voice, videophone and packet services as available to users within Japan.

When investigating the prospects of making our packet-based services such as i-mode available to overseas markets, we encountered various issues concerning conformation to laws of the target countries, including copyright laws and consumer protection laws related to providing information contents customized for the target countries of demonstration and to maintaining copyrights of Contents Providers (CP) of games and ring tones. In case of voice and videophone, it was necessary to regulate the services under our control, including Melody Call and M-stage V Live (hereinafter referred to as V Live) services, with regards to certain types of contents due to problems related to copyright control. Moreover, the demonstration environment is identical to the environment made available when traveling to overseas locations; that is, the conditions provided to use the i-mode services conform to the international roaming. For this reason, services that are not provided in international roaming (e.g., reverse billing (billing on the server side) and Message F (free)) are regulated as well.

An emergency call from Japan is controlled in such a way that the location of the originator is identified and the call is connected to the optimal emergency organization based on geographical conditions. In case of emergency calls from overseas locations, on the other hand, it was necessary to regulate the

calls so that they are not connected to emergency organizations within Japan. Moreover, it was necessary to add a function that allows connection to a local emergency organization if an emergency number in a given area is dialed in an overseas country where a demonstration is performed.

In order to satisfy these requirements, we have developed dedicated processing functions conforming to the roaming-out connection customized for countries where Base Transceiver Stations (BTS) are placed, and implemented in the Mobile Multimedia switching System (MMS), Wireless Protocol Conversion Gateway (WPCG) and treasure Casket of i-mode service, high Reliability platform for CUSomer (CiRCUS) services.

2. Network Configuration

Figure 1 shows the network configuration. Only the BTS is stationed in an overseas location and is connected to a Radio Network Controller (RNC) via a dedicated line. Nodes upstream of the RNC use the FOMA network within Japan; it is thus technically possible to provide the same voice, videophone and packet services as in Japan, even in overseas locations.

When stationing a BTS in an overseas location, it is neces-

sary to identify that communication with mobile terminals in the area is from the BTS-stationed country. For this reason, we have developed a function that allows a Local Mobile Multimedia switching System (LMMS) node to identify a call by a Location Area Code (LAC).

FOMA uses LACs in order to identify the general call area when receiving calls. The appropriate LAC is notified to an LMMS node when a mobile terminal requests location registration.

When stationing a BTS in an overseas location, an overseas LAC, which is different from the LACs assigned for use within Japan, is assigned to the BTS-stationed country, and a Mobile Country Code (MCC) of the BTS-stationed country corresponding the overseas LAC is stored in the LMMS nodes.

In case of communication with a BTS-stationed country, the relevant LMMS node is thus able to perform customized processing for the country, based on the LAC of the area in which the target mobile terminal is currently situated, at the beginning of the communication.

The following chapters explain these functions installed in each node of the FOMA network using specific examples.

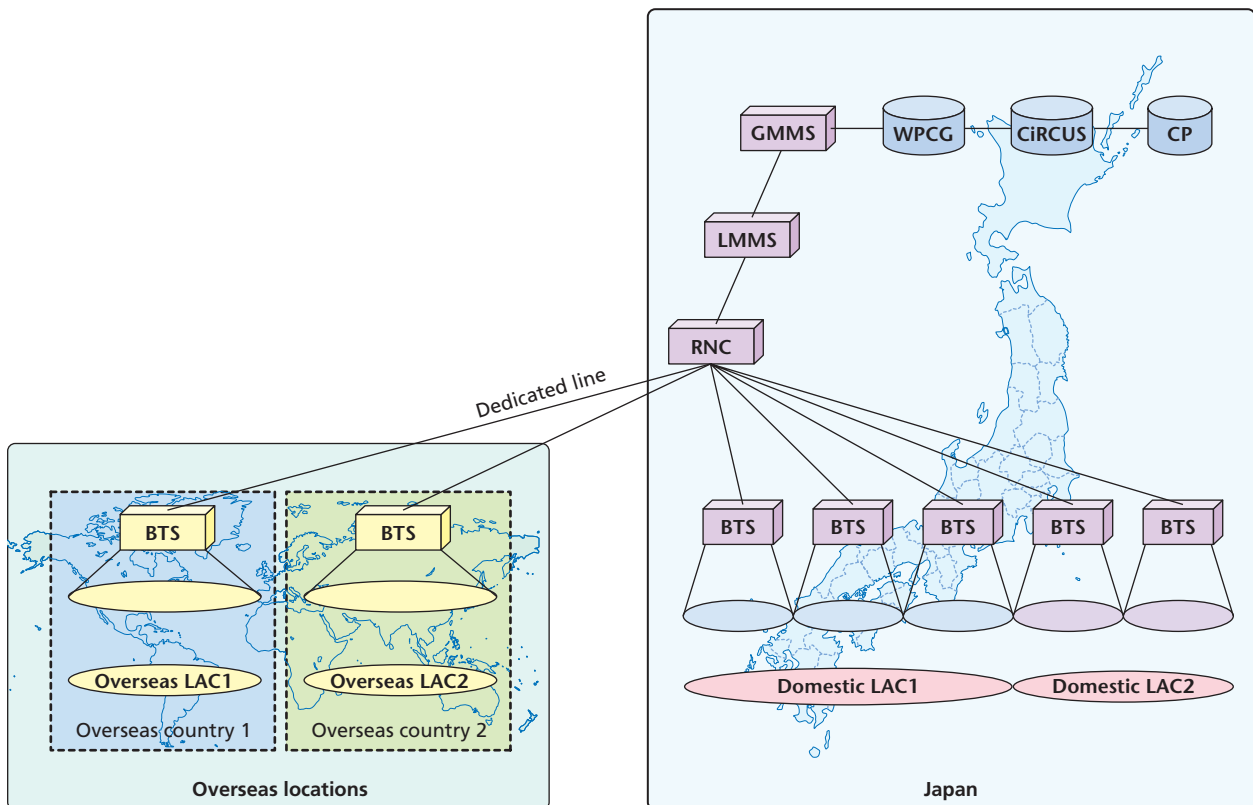


Figure 1 Network configuration

3. Circuit Switching Processing via BTS-Stationed Overseas

The functions installed in MMS nodes for circuit switching when a mobile terminal is situated in a BTS-stationed area are explained below.

1) Regulating Connections to Emergency Organizations within Japan

Upon receiving a call request to the Japanese police (110), fire/emergency services (119) or the Japan Coast Guard (118), the receiving LMMS node checks the LAC to identify whether the LAC of the area in which the calling mobile terminal is situated corresponds to an LAC within Japan or an overseas LAC in order to judge whether the call was made from an area within Japan or a BTS-stationed overseas country. If the call is from within Japan, the call is connected to the corresponding emergency organization. If the call is from a BTS-stationed overseas country, a voice message explains that it is not possible to connect the calling mobile terminal to 110 or 119, and connection is inhibited by terminating a call (**Figure 2**).

2) Connecting to Emergency Organizations in BTS-Stationed Countries

When a mobile terminal in an area of a BTS-stationed overseas country is calling an emergency number of the relevant country, the call is routed to one of the numbers of the given emergency organization's main switchboard.

Upon receiving a call request from a mobile terminal, the

receiving LMMS node checks the LAC of the area in which the calling mobile terminal is situated; if it recognizes that the call is from an BTS-stationed overseas country it judges whether or not the dialed number is an emergency number. If the number is an emergency number of the relevant country, the LMMS node routes the call to one of the numbers of the corresponding emergency organization's main switchboard stored in the LMMS node in advance. Note that the user is not billed, since it is a connection to an emergency organization (**Figure 3**).

3) Regulating Melody Calls and Specific V Live Connections

A function was implemented such that when a call is transmitted from a mobile terminal in a BTS-stationed overseas location where a DoCoMo mobile terminal subscribed to the Melody Call service, the normal ringtone, rather than the melody, is heard.

A ringtone is normally sent to the calling mobile terminal from the switching device in the area where the receiving mobile terminal is; thus, the LMMS node receiving a call request checks the LAC of the area in which the receiving mobile terminal is situated. If it recognizes that the call is routed via an overseas BTS, it sends the Melody Call restriction information to the switching device in the area where the receiving mobile terminal is, and the normal ringtone is played back to the calling mobile terminal.

Previews of Melody Call and specific V Live connections are implemented by means of a function similar to the emergency call regulation.

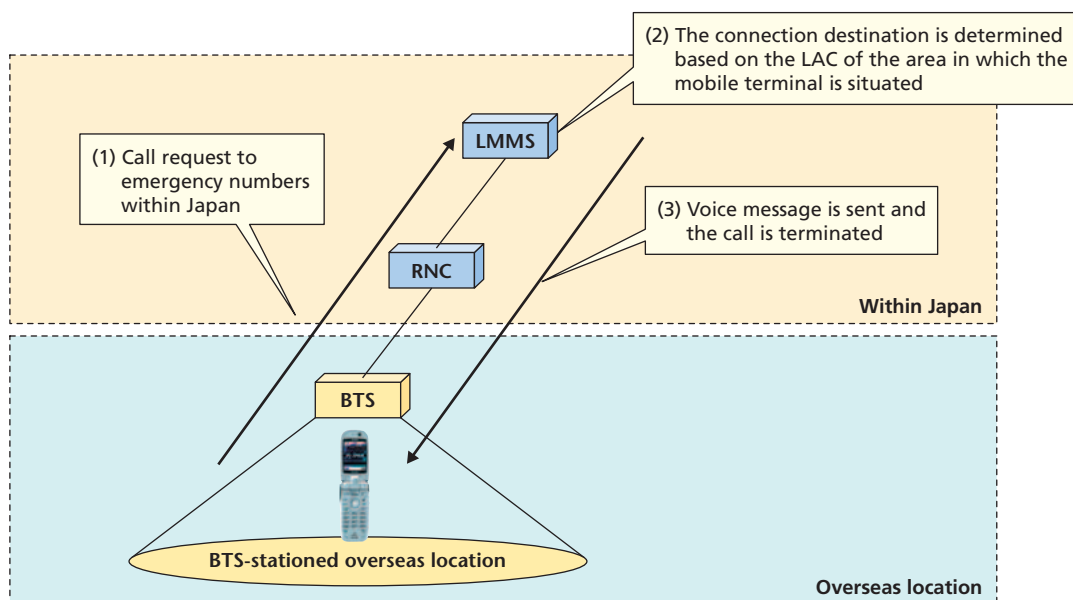


Figure 2 Processing for regulating connections to emergency numbers within Japan from a BTS-stationed overseas area

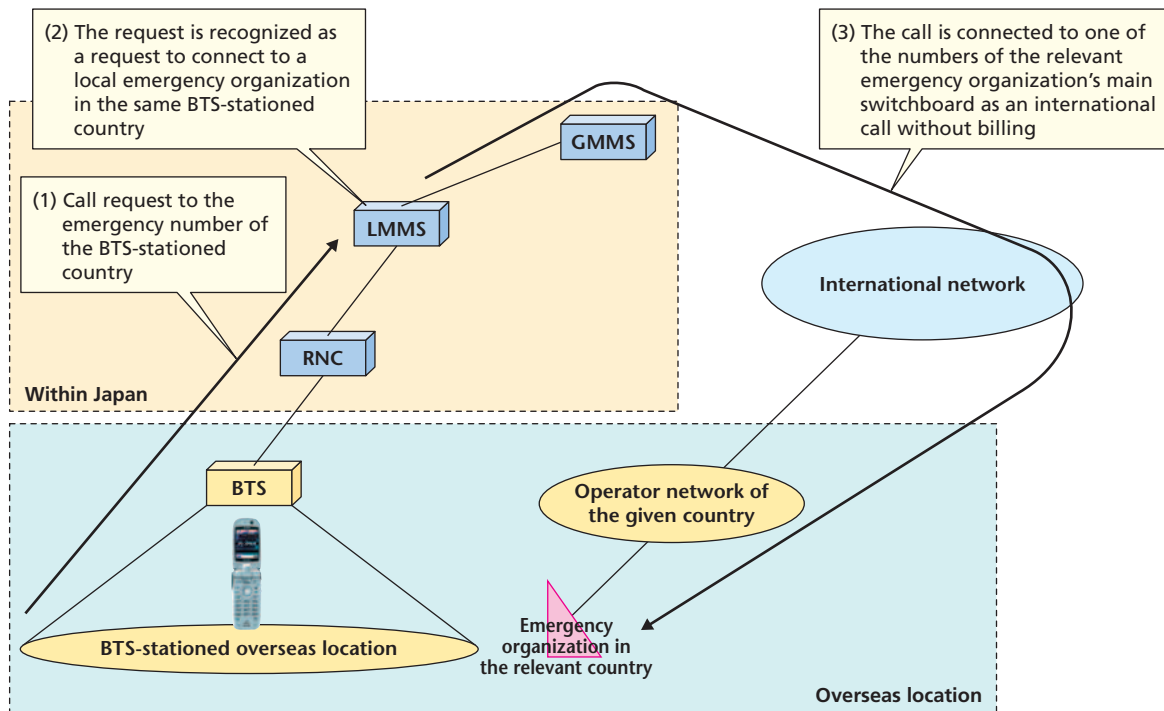


Figure 3 Processing for connecting to local emergency numbers at a BTS-stationed overseas location

4. Packet Communication Processing via BTS-Stationed Overseas

4.1 Functions Implemented in MMS

1) Notifying Country Information to WPCG

In packet communication with a BTS-stationed country, it is often required to perform specific processing for the country where the connecting mobile terminal is situated in a host node such as a server; it is thus necessary to notify the country information to WPCG.

Thus, once the BTS-stationed country has been identified by the LAC in packet communication, the LMMS node notifies an MCC as the country information to a Gateway Mobile Multimedia switching System (GMMS) node using the GPRS Tunneling Protocol (GTP).

The GMMS node, upon receiving the MCC from the LMMS node, notifies the MCC and information about the BTS-stationed overseas to WPCG by the NetWork Management Protocol (NWMP) (Figure 4 (1) to (4)).

2) Regulating Specific Access Point Names (APN)

Some packet connection services provided by FOMA are not allowed to be provided to overseas travelers. In order to address this issue, GMMS nodes are equipped with a function to regulate these connections. Conditions to permit connections from overseas locations for each connected APN are stored in

the GMMS nodes in advance, and they judge whether it is allowed to connect to a specified APN from an overseas location when an MCC is notified from an LMMS node. If the connection is not allowed as a result, the GMMS node regulates the connection. Here, the same connection conditions from roaming-out users are set for the conditions to permit connection for each APN to allow providing packet communication services under the same conditions as roaming-out communication.

4.2 Functions Implemented in WPCG

1) Notifying Country Information to CiRCUS

When an MCC and information about a BTS-stationed overseas are notified from a GMMS node via the NWMP Connection Notification, WPCG attaches a header identifying the calls from overseas and the MCC to the HTTP Request from a mobile terminal. By notifying this information to CiRCUS, CiRCUS can provide proper contents to appropriate users (Fig. 4 (5)).

2) Controlling Packet Reception in BTSs-Stationed Overseas Location

i-mode services include user billing and reverse billing services. User billing is a service where users are billed for sending and receiving mails, for example. The reverse billing, on the other hand, is a service where packet communication fees for viewing sites are charged not to users but contents providers [1].

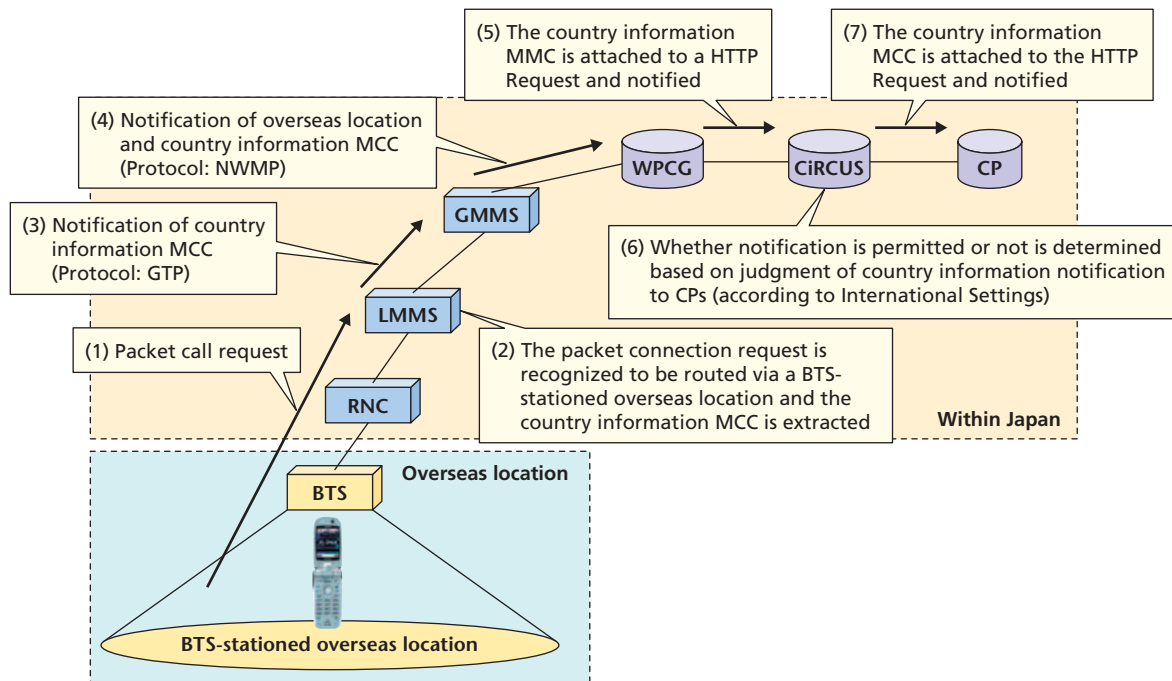


Figure 4 Packet communication processing via BTS-stationed overseas

In a BTS-stationed overseas, the reverse billing service is not provided according to the services provided for international roaming. For this reason, connection to Pull-type services from a mobile terminal via a reverse billing site is restricted by CiRCUS, whereas Push-type services such as Message F must be restricted by WPCG.

Specifically, WPCG judges which services can be received based on the reception information included in the NWMP reception notification received via the Gateway service representative internet market mobile access exchange Management Protocol (GMP) received from CiRCUS, allowing reception by the mobile terminal if the service is allowed to be received in overseas locations as well (e.g., mail and Message R (request)), and disallowing reception if the service is not allowed to be received (e.g., Message F).

4.3 Functions Implemented in CiRCUS

1) Notifying Country Information to CP

CiRCUS is able to pass an MCC notified from WPCG as country information on to a CP upon obtaining permission from users, so that CPs can provide contents in accordance with any copyright restrictions placed on the contents and the travel destination of the user based on the country information (Fig. 4 (6) (7)).

2) International Settings

Before the country information is passed on to a CP, the

user is asked to permit notifying personal information to CPs. The “International Settings” function was implemented in the Options screen in the portal menu of CiRCUS in order to handle this request, allowing the user to specify whether or not regional information may be notified to CPs when traveling abroad.

With this function, it is possible to allow overseas traveling users, who have not activated International Settings (i.e. those who selected “No” for International Settings), to access mail and portal screens only and prohibit them from accessing official contents and general sites. **Figure 5** shows specific option setting screen images, including “International Settings.”

3) Restricting Specific Services

In the i-mode services, providing services conditions are not the same as in Japan in some overseas locations, and some services may hence not be provided. CiRCUS is equipped with a function that allows service regulation based on country information taking services that cannot be provided into consideration; one example is “i-area,” which does not have any contents corresponding to base station information.

4) Displaying Portal Screen for Overseas Locations

Since there is a possibility that some portal services cannot be provided for users traveling abroad, CiRCUS is equipped with a function that provides a special portal screen for overseas locations, based on the country information of the location the user travels to.

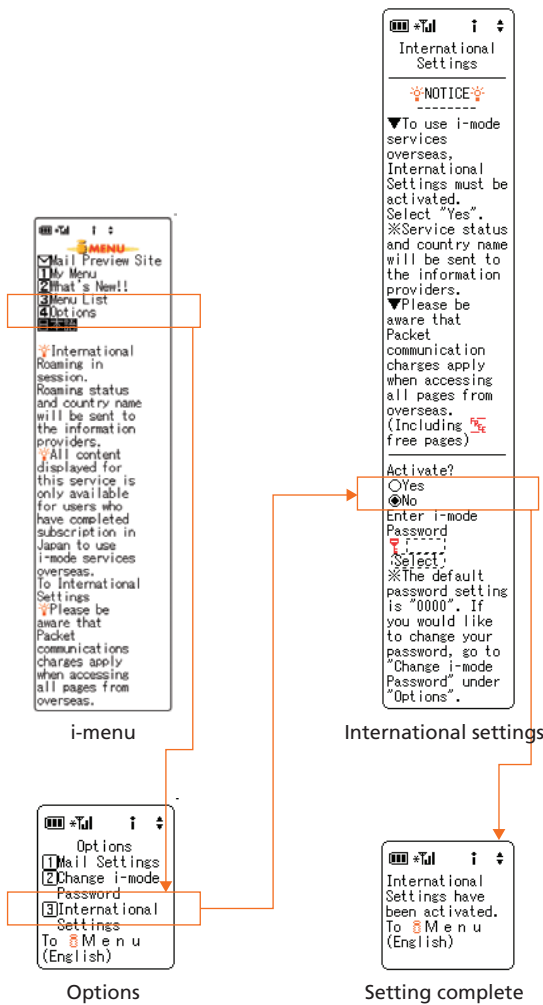


Figure 5 Screen images of International Settings

ABBREVIATIONS	
APN:	Access Point Name
BTS:	Base Transceiver Station
CiRCUS:	treasure Casket of i-mode service, high Reliability platform for CUSomer
CP:	Contents Provider
FOMA:	Freedom Of Mobile multimedia Access
GMMS:	Gateway Mobile Multimedia switching System
GMP:	Gateway service representative internet market mobile access exchange Management Protocol
GTP:	GPRS Tunneling Protocol
LAC:	Location Area Code
LMMS:	Local Mobile Multimedia switching System
MCC:	Mobile Country Code
MMS:	Mobile Multimedia switching System
NWMP:	NetWork Management Protocol
RNC:	Radio Network Controller
WPCG:	Wireless Protocol Conversion Gateway

5. Conclusion

By implementing the BTS-stationed overseas as part of the FOMA network, it became possible to flexibly demonstrate the usage of FOMA all over the world. This function can be used for demonstrations in overseas locations to heighten the recognition of FOMA among potential overseas users.

REFERENCES

[1] Hanaoka, et al.: "IMT-2000 Reverse-Billing Service," NTT DoCoMo Technical Journal, Vol. 4, No. 3, pp. 17-26, Dec. 2002.