Ringback Tones | Audio Source Playback | Music Content

Technology Reports

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Expansion of Melody Call for Enhanced Music Services

Melody Call is a music service for mobile phones that has created a market for music content alongside ringback tone services such as Chaku-mero. We have expanded the functions of the Melody Call service to make it more user-friendly and to create opportunities of content listening.

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1. Introduction

With the growth in domestic broadband connectivity and the success of mobile digital music players such the iPod®*1, the Internet has now become a popular means for the delivery of music content on desktop PCs. On mobile phones, since the commencement of i-mode services in February 1999, Chaku-mero services have experienced rapid expansion and market penetration. Recently, rich content has been made available by Chaku-uta and by Chaku-motion and other video delivery services. Once a user has downloaded content to a terminal (be it a desktop PC or a mobile terminal), these services all allow the content to be played back according to the user's own operations and settings. On the other hand, the Melody Call service (launched in September 2003) is aimed exclusively at mobile phones and allows the recipient of a call to send a preset melody back to the caller as a ringback tone. It could be said that this service has created the opportunity for users to listen to music content in a natural way while using their mobile terminals in their daily lives. The number of users passed the 10 million mark in March 2007, and has continued to increase steadily since then. This increase in subscriber numbers could be partly due to the fact that we have continued to develop a wide variety of expansion functions to improve the usability since the launch of this service. In this article, we describe the details of the development of the Melody Call expansion functions. In Chapter 2 we present an overview of the basic Melody Call functions, and in Chapter 3 we discuss the content billing functions aimed at facilitating the participation of content providers. In Chapter 4 we describe the trial preview function aimed at making the service more convenient for users. And in Chapter 5 we describe the delivery target call expansion function which is aimed at expanding the opportunities to listen to Melody Call content.

2. Basic Functions of Melody Call

2.1 System Configuration and Functional Allocation

A general overview of the Melody

*1 **iPod®**: A registered trademark of Apple Computer, Inc.

Call service is shown in **Figure 1**. First, the content provider registers content on a Flexible Ring Back Tone (FRBT) server. When a contract user establishes an i-mode connection to perform music settings, the setting information is registered in the core network device group. After that, if the contract user is called from another mobile terminal, the set music is delivered to the calling terminal. The configuration of the core network device group is shown in **Figure 2**. The FRBT server is responsible for the generation of i-mode screen displays, notification of content billing information and master administration of audio source data registered by content providers, the New Mobile Information Storage system (NMIS)[*2] provides Melody Call delivery functions, and the New Mobile Service Control Point /IP Service Control Point (NMSCP/IPSCP)[*3] manages contract information and phone number lists (**Table 1**).

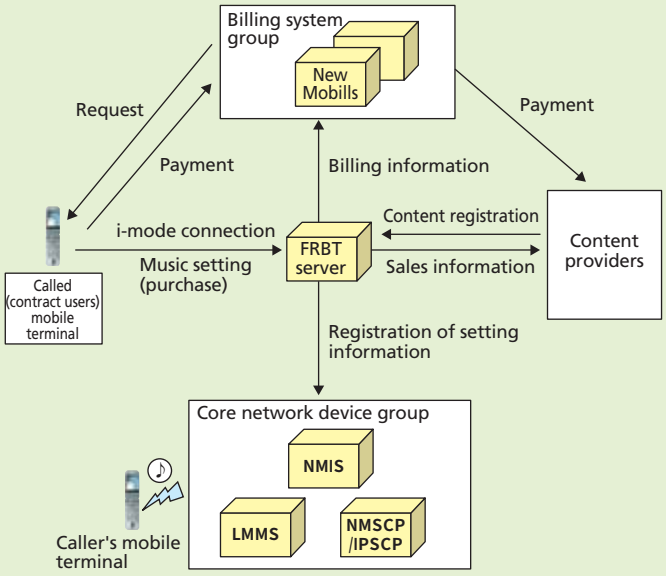

Figure 1 General overview of the Melody Call service

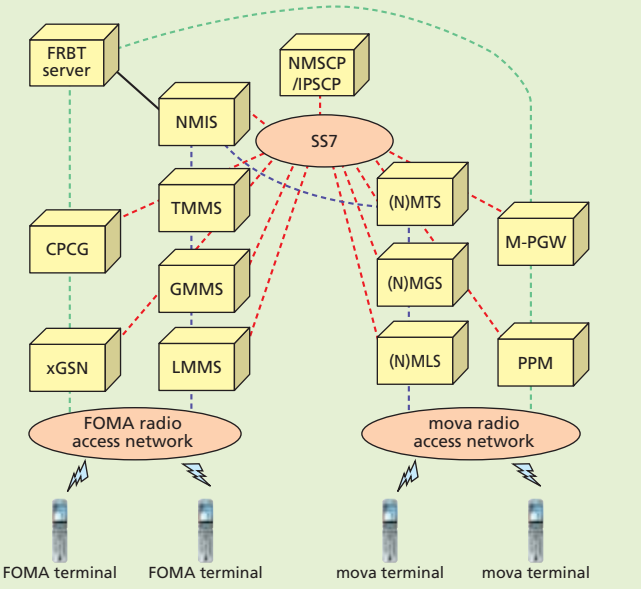

Figure 2 Configuration of the core network device group

Table 1 Functional allocation of main nodes

Nodes	Functional allocation
FRBT server	• i-mode screen display for Melody Call • Notification of content billing information • Phone number list management • Audio source box information management • Audio source data master management
NMIS	• Melody Call delivery • Audio source box information management • Audio source data management
NMSCP /IPSCP	• Contract information management • Phone number list management
T/G/LMMS /(N)MTS /(N)MGS /(N)MLS	• Melody Call transfer
xGSN/CPCG/ PPM/M-PGW	• Data transfer by i-mode communication

*2 **NMIS**: A device that provides storage services such as voice message and short mail and delivery-related services such as Melody Call and video guidance in FOMA and mova networks.

*3 **NMSCP/IPSCP**: A device that has service control functions and functions for the management of subscriber service information (contract information and setting information).

Since the Melody Call service provides a common service to FOMA and mova networks, it includes functions for both communication systems.

Taking FOMA as an example, we will explain the Melody Call delivery procedure which is performed when a call is received, and how the music setting is performed using i-mode.

2.2 Music Setting with i-mode

The music setting process in i-mode is shown in **Figure 3**. A contract user establishes an i-mode connection, and on an i-mode setting Web page provided by the FRBT server, the user is able to modify the music settings in an audio source box and a list of caller phone numbers to which the music will be played (Fig. 3(1)). When the FRBT server receives the setting modification operations, it transmits a registration request to the NMIS (Fig. 3(2)). This registration request is set with the audio source box information and phone number list. When the NMIS receives the registration request, it holds the audio source box information, transmits an audio source data download request to the FRBT server, and downloads the audio source data set in the audio source box (Fig. 3(3), (4)). When it has finished downloading, the NMIS transmits a list setting request to the NMSCP/IPSCP (Fig. 3(5)). This list setting request is set with the phone number list. When the NMSCP/IPSCP receives the list setting request, it holds the phone number list.

2.3 Delivery of Melody Call When Calls are Received

The Melody Call delivery process that takes place when a call is received is shown in **Figure 4**. When it has received an incoming call request, the Local

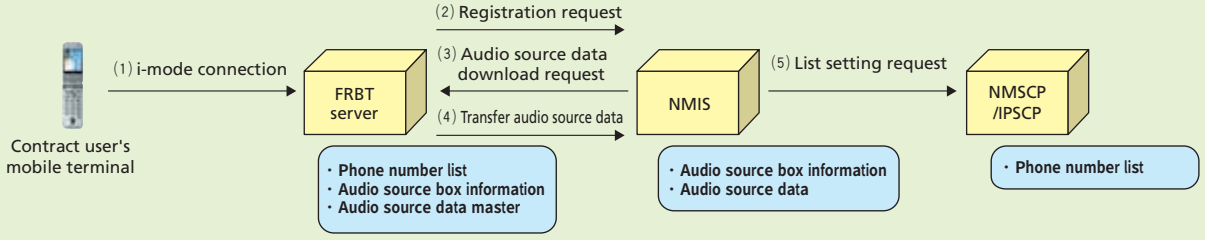

Figure 3 i-mode music setting process

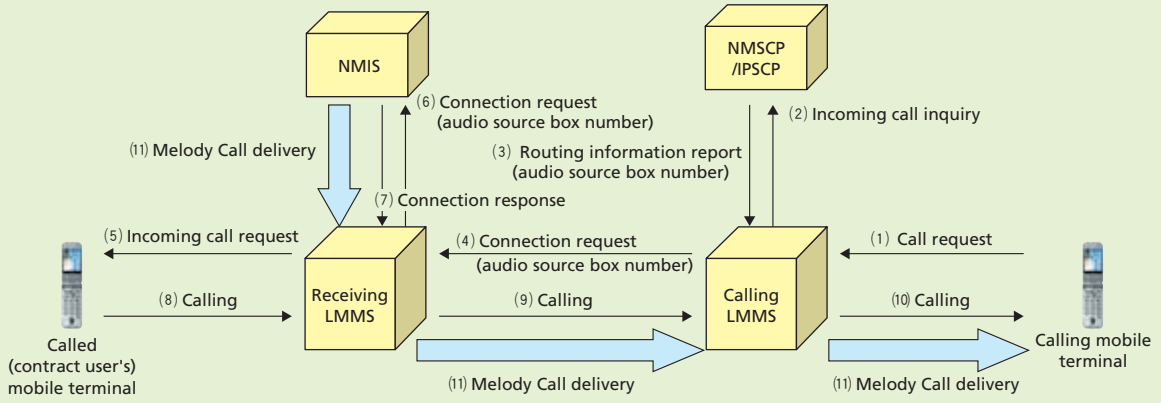

Figure 4 The Melody Call delivery process when a call is received

Mobile Multimedia switching System (LMMS)[*4] at the calling side transmits an incoming call inquiry to the NMSCP/IPSCP (Fig. 4(1), (2)). When the NMSCP/IPSCP receives this inquiry, if the calling user is a Melody Call contract user, then it check the caller phone numbers list and sets the audio source box number registered by the phone number in a routing information report[*5] which it transmits to the calling LMMS (Fig. 4(3)). On receiving the routing information report, the calling LMMS looks for the audio source box number and, if it finds one, it sets it in a connection request which it transmits to the LMMS at the receiving side (Fig. 4(4)). When it receives a connection request in which an audio source box number has been set, the receiving LMMS on the receiving side establishes a U-Plane[*6] path to the calling LMMS, transmits the incoming call request to the receiving mobile terminal, and then transfers this to the NMIS (Fig. 4(5), (6)). When the NMIS receives a connection request in which an audio box number has been set, it transmits a connection response to the receiving LMMS, and the audio source data set on this audio source box number begins to play back (Fig. 4(7)). When the receiving LMMS has received the connection response, the U-Plane path to the NMIS is established after the calling signal has been received from the receiving mobile terminal (Fig. 4(8)). When the receiving LMMS has received the calling signal, it transmits it to the calling LMMS, and the calling LMMS transfers it to the calling mobile terminal, thereby establishing a U-Plane path to the calling mobile terminal (Fig. 4(9), (10)). In this way, a U-Plane path is established from the NMIS to the calling mobile terminal, the Melody Call is delivered, and the music set by the called (contract user's) mobile terminal can be heard on the calling mobile terminal as a ringback tone (Fig. 4(11)).

3. Introduction of Content Billing Functions

3.1 Modification of Business Model

When the Melody Call service was first introduced, NTT DoCoMo bought in a collection of music from content providers and adopted a business model whereby contract users were able to register up to three tunes per month for a fixed charge.

Although this model played a role in the rapid uptake of the Melody Call service, the content providers found it difficult to introduce their own pricing systems or flexible promotions, resulting in obstacles to participation from new providers and the supply of new content, and the growth in the number of items of content available for this service was starting to tail off. The subscribers were also starting to demand the provision of attractive content.

To resolve these issues and further expand the service, we decided to modify the business model so that content providers can provide music more freely. The system function corresponding to this modification is the content billing function.

3.2 Implementation Issues

In implementing the content billing function to the system, we encountered three main issues:

- Development of a function for billing customers when they purchase content (Section 3.3)
- Development of a function for allowing content providers to register content directly in the NTT DoCoMo system (Section 3.4)
- Development of a function to allow content providers to tune the audio quality for use in the Melody Call service (Section 3.5)

The functions we developed to resolve these issues are described below.

3.3 Billing Function

An essential requirement for the development of this function was the need to design it so that billing errors cannot occur even when the end user's operations are interrupted or a system error occurs. We therefore adopted a design where billing is settled after performing identity verification and completing the registration of the audio source. The billing system when purchasing content is shown in **Figure 5**.

After the content purchase has been confirmed by the user at the content provider's Website, the content ID is reported from the content provider's serv-

*4 **LMMS**: A switching system at the subscriber level for circuit-switching communication in the FOMA network.
*5 **Routing information report**: A signal that reports the number of the exchange with which the called mobile terminal is associate during the initiation and reception of calls.
*6 **U-Plane**: A path for the transmission of user data to the C-Plane, which is a control signal transmission path.

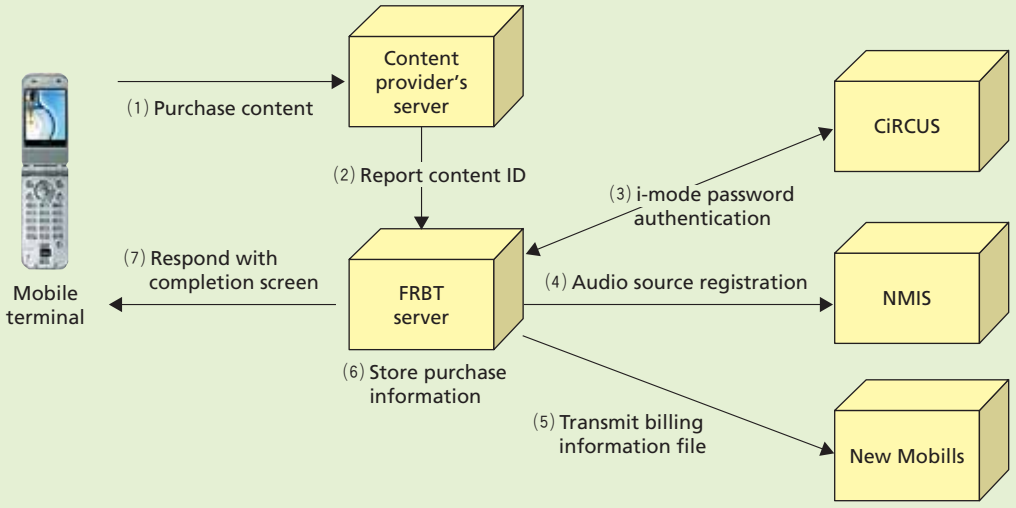

Figure 5 Billing system when purchasing content

er to the FRBT server (Fig. 5(1), (2)).

An i-mode password input image from the FRBT server is displayed on the mobile terminal, and the input password is checked against the i-mode server's treasure Casket of i-mode service, high Reliability platform for CUStomer (CiRCUS). This i-mode password authentication is used to confirm the individual making the purchase, and establishes a contract between the user and content provider (Fig. 5(3)). Next, using the same interface as before, registration of the audio source is performed from the FRBT server to the NMIS (Fig. 5(4)). Finally, the billing is confirmed by transmitting a Billing information file (Bill file) from the FRBT server to the new Mobile communication billing systems (Mobills), which is a billing server shared by the NTT DoCoMo internal systems (Fig. 5(5)). To provide timely sales information to the content provider, the purchase information is also stored in the FRBT server (Fig. 5(6)).

The new Mobills system is also responsible for making payments to content providers after subtracting handling charges etc. from the total sale price.

3.4 Content Registration Function

Since the Melody Call service delivers music from a core network device such as an NMIS, the content providers must register the audio source data in the NTT DoCoMo server in advance. In this respect, it differs from content services of the type where clients download and listen to content on mobile terminals.

We decided to make the system that performs this registration work freely accessible to the content providers. It was necessary to satisfy the following conditions to meet the needs of content providers:

- It should be possible to deliver large quantities of audio source data at a time.
- It should be possible to perform flexible maintenance even on detailed information such as the audio source information (content titles, etc.).
- It should be possible to use ordinary software that people are accustomed to working with, such as Web browsers and File Transfer Protocol (FTP) clients.

From a security viewpoint, it was also necessary to satisfy the following conditions:

- The system should be designed to prevent the leakage of audio source data or audio source information.
- The system should be designed to prevent attacks on servers over the Internet.

After investigating schemes for satisfying all five of these requirements, we

introduced an Internet Virtual Private Network (VPN) adopting Security architecture for Internet Protocol (IPSec) (**Figure 6**).

Since IPSec operates in a tunneling mode where communication is performed at level 3 (IP layer) while using circuits established over the Internet, it allows the protocols FTP (which supports whole-file transfers) and HTTP (which supports browser-based maintenance of information) to be used at the application layer. Since the communication is encrypted, it is possible to prevent the leakage of information en route over the Internet, and since access is only possible from PCs on which the dedicated VPN software has been installed, it is also possible to prevent attacks on the server.

This registration system was originally intended for use by internal operators, so to open it up to the content providers, we comprehensively reviewed the user interface and designed the system to make every effort to prevent user errors.

To prevent the commercial supply of objectionable content, we also added a workflow whereby content is only made available for purchase after the request from the content provider has been approved by NTT DoCoMo.

3.5 Audio Quality Tuning Function

Since Melody Call music is delivered wirelessly and heard from the earpiece of a mobile terminal in the same way as the audio communication in ordinary mobile terminals, the audio source must be tuned appropriately. We therefore introduced a mechanism whereby content providers can tune the audio quality of their content on an actual mobile terminal before making this content available to the end user (**Figure 7**).

Here, to ensure that music is not leaked out to other companies or made available to ordinary users while tuning is in progress, we added a function whereby a phone number to be used for this purpose is registered for each content provider, and only this mobile terminal can be used for tuning.

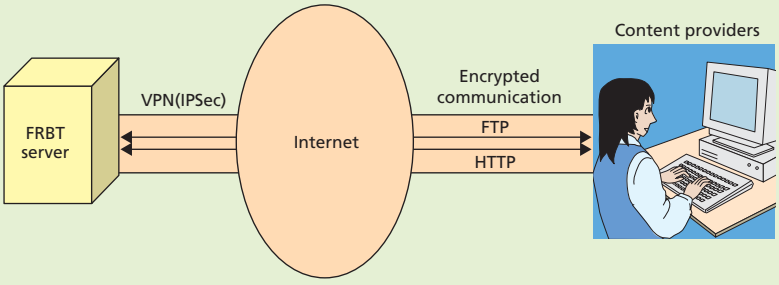

Figure 6 Outline of Internet VPN connection

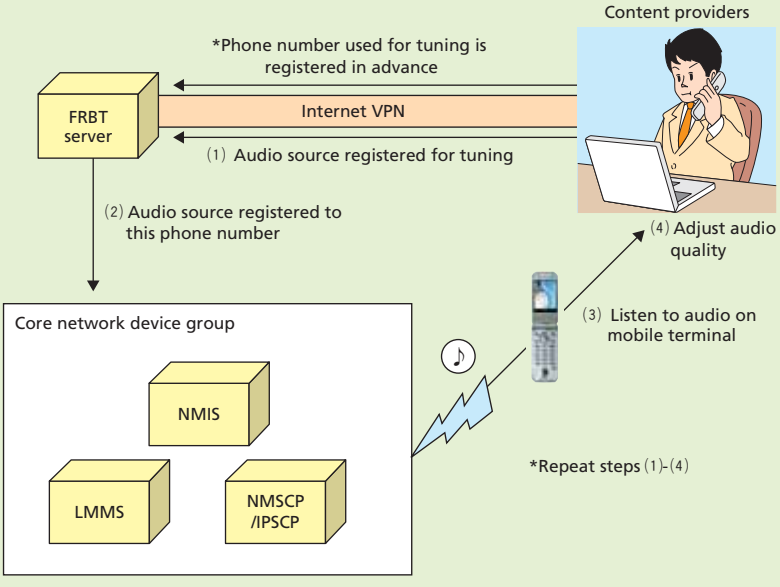

Figure 7 Outline of audio quality tuning system

3.6 Advantages

With the introduction of a content billing function, we succeeded in changing our business model from a closed model restricted exclusively to the NTT DoCoMo site to an open model where content can be provided freely by content providers.

At the same time, we ensured that the system is sufficiently secure and user-friendly for use by content providers.

As a result, the number of items of content available increased from about 3,000 before the introduction of this function to over 80,000 (as of March 2008), and is still increasing at a rate of about 5,000 items per month. This has greatly contributed to the popularity of the Melody Call service.

4. Trial Preview with Subscribers and Non-subscribers

When the Melody Call service was first launched, users were not able to listen to the music themselves until they had entered into a contract and paid for the music. However, due to the characteristics of listening to music delivered over a wireless network, a function was needed for checking the audio quality of the Melody Call service. Also, since the music is only played for a short time while making a call, it was important to allow confirmation of which part of the selected audio source to playback. To respond to the users' needs in such respects, we first developed a trial preview function for subscribers, and we then developed a trial preview function for non-subscribers.

The trial preview function for subscribers was implemented by allowing the registration of a trial preview audio source in a previously unused audio source box.

Since the trial preview function for non-subscribers made a Melody Call function that had previously been restricted to subscribers available to non-subscribers as well, it was necessary to secure a region in the NMIS for the storage of audio sources corresponding to all NTT DoCoMo users in order to implement this function. However, since the trial preview function for non-subscribers does not operate constantly, it was assumed that the operating ratio of the facilities would be lower. We therefore assumed a service flow whereby the trial preview audio source is set by i-mode in the same way as the subscriber trial previews, and here we adopted a method whereby a temporary audio source box is generated for the NMIS trial preview. Once this temporary audio source box has been generated, it is automatically deleted after a fixed period of time. This allowed us to minimize the requirements for additional facilities and to operate our existing facilities efficiently, and as a result we were able to introduce this function quickly and at low cost. With the introduction of this function, non-subscribers can try out the service and listen to the actual content they are interested in before they sign up for the Melody Call service. This has made it possible to lower the psychological barrier faced by users when asked to enter into a contract, and has contributed to the increased number of contracts.

5. Expanding the Melody Call Delivery Target Calls

When the service was first launched, the delivery of Melody Call content was limited to calls originating from NTT DoCoMo. In February 2005, Melody Call was interconnected with the EZ Machi Uta service of au®*7, and in October 2007 we started delivery of the service over NTT's fixed network. To deliver this service over NTT's fixed network, in order to satisfy the regulations regarding equipment specifications and to address the needs of corresponding operators, it was necessary to inform users that the phone was ringing before delivering the Melody Call content, and this involved additional development work.

Originally, when most users were unfamiliar with the Melody Call service, guidance was inserted at the beginning of the audio source data to inform users that the remote phone was ringing. However, with the increasing awareness of Melody Call, this guidance has in fact become detrimental to the usability, and thus we have been gradually switching over to the use of audio source data with no added guidance. From this sequence of events, the issue has arisen of controlling each operators so that guidance is only added to the Melody Call delivery in the case of calls originating from NTT's fixed net-

*7 **au®**: A registered trademark of KDDI Corporation.

work, instead of uniformly adding guidance to any call made from any network. To solve this issue, we developed a function whereby the calling network is identified in calls entering via the Gateway MMS (GMMS) which is the Point Of Interface (POI) with other operators, and a guidance insertion flag is set in the connection request and delivered to the NMIS. Also, to enable flexible modifications of the guidance insertion settings for each calling operators, we made it possible to change the setting by means of operational work. In this way, we greatly expanded the opportunities for users to listen to Melody Call content by allowing it to be delivered over the NTT fixed network without spoiling the usability of NTT DoCoMo or au.

6. Conclusion

In this article, we have described the expansion functions and implementation method to expand the market of the Melody Call by mobile phone music service.

We are still working on ways of making this service more convenient, including random playback functions that allow various different items of music content to be delivered by making a few simple settings.