

Special Articles on HSDPA

System Development for Music Channel Service Using HSDPA

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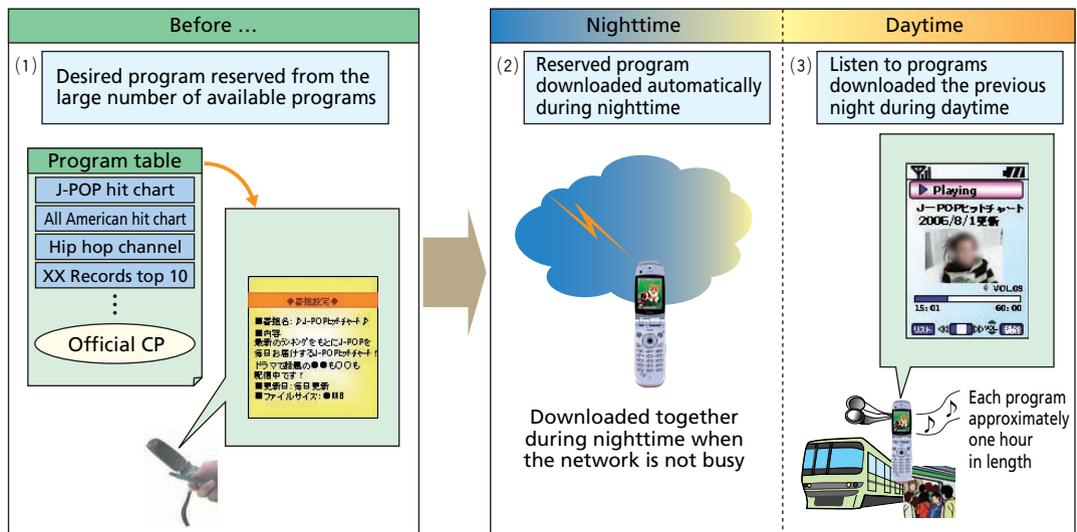
*The HSDPA communications system adopted in the FOMA network and mobile terminals allows the downloading of large-capacity content such as high-quality music and video. A system that provides Music Channel^{TM*1} service using HSDPA has been developed to enable the downloading of large-capacity music content.*

1. Introduction

The use of services providing the downloading of such information as radio content over extended periods of time by using an i-application player, for example, has increased following the introduction of “pake-hodai” (packet flat-rate service) in June 2004. Under these circumstances, the use of such services by large numbers of users over a long time increases the network load, which may result in a lack of network resources.

The introduction of a High Speed Downlink Packet Access (HSDPA)-compatible FOMA network and mobile terminals starting from August 2006 enables the downloading of large-capacity content such as high-quality music and video, which were considerably difficult on conventional networks. The Music Channel service was introduced as an application of HSDPA technology, and allows the user to reserve a music program for automatic downloading during nighttime when network traffic is low. Furthermore, the system adopts a new distribution method for the trouble-free acquisition of large-capacity content, and facilitates more efficient use of network resources.

*1 Music ChannelTM: A trademark of NTT DoCoMo, Inc.



*This service is provided only in Japanese at present.

Figure 1 Image of using the music channel service

This article outlines the functions developed for the Music Channel service, and describes the methodology adopted in its implementation.

2. Service Overview

Figure 1 shows the use of the Music Channel service. A contract and a Music Channel-compatible HSDPA mobile terminal are required to use this service. The user reserves the Music Channel service program from a Contents Provider (CP) site on i-Menu. Program reservation, the reserved program, and the downloaded program are managed via the dedicated mobile terminal application (Fig. 1 (1)). In order to distribute traffic, the distribution date desired by the CP is set for each day of the week for each program, and the programs are distributed during nighttime on each distribution date (Fig. 1 (2)). The distributed content may be played at any time on the dedicated player on the mobile terminal (Fig. 1 (3)).

3. System Requirements and Configuration

System requirements were investigated in consideration of the following for developing the functions related to the Music Channel service.

- 1) Distribution of network load
 - A method of reducing, as much as possible, the load on the

network was required to ensure that downloads were not concentrated in the same time zone

- 2) Content guarantees
 - Acquisition of content is to be guaranteed by DoCoMo
- 3) Simplification of the CP contract
 - Use of the existing i-mode My-Menu certification system to ensure simplicity of the contract concluded between the CP and the user

In addition to satisfying these requirements, the system configuration adopted for the service was based on the i-channel service that has very similar requirements (such as the ability to link user information with i-mode, and providing an interface for acquiring content from the CP). Figure 2 shows the system configuration.

4. Music Channel Server

4.1 Service Contract

Users using HSDPA mobile terminals must conclude a contract for the Music Channel service. User information is communicated to the user database on the Music Channel server via treasure Casket of i-mode service, high Reliability platform for CUSomer (CiRCUS)^{*2} in the form of a Service Order (SO) from the ALI Around DoCoMo InformationN systems

*2 CiRCUS: An i-mode gateway system.

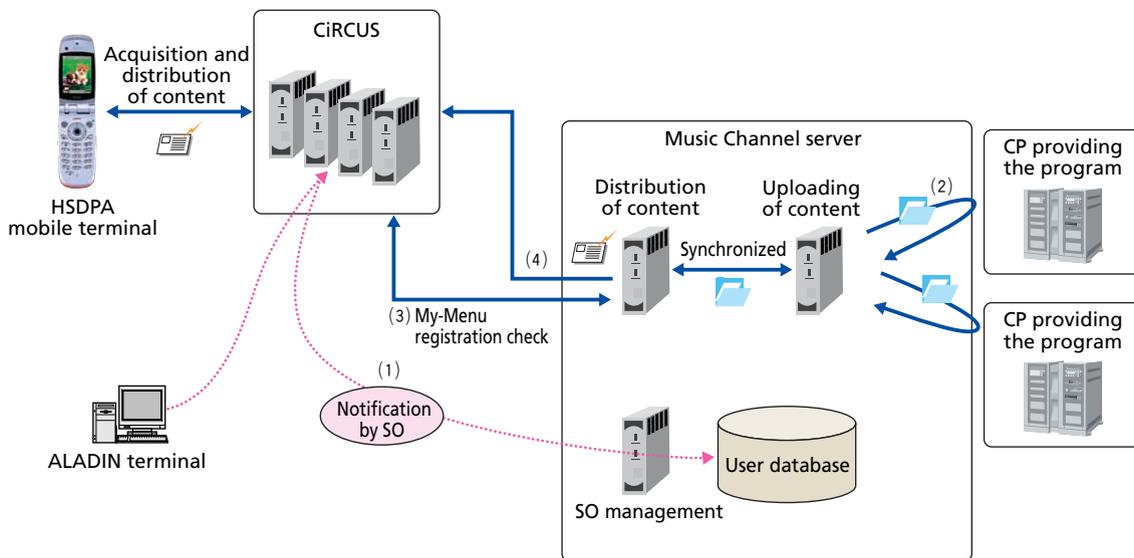


Figure 2 Music channel system

(ALADIN)^{*3} terminal (Fig. 2 (1)).

4.2 Acquisition of Content from the CP

Since DoCoMo charges for the distribution of content as part of the Music Channel service, it is an essential responsibility for DoCoMo to distribute this content without delays. A system was therefore adopted in which content is acquired from each CP and placed on the server prior to the distribution date to ensure that the operational status of the CP server does not affect the distribution of content.

For each program, the CP prepares a “content file” comprised of a header file containing the program information and multiple music files (hereinafter referred to as “chapter files”), as well as an “Message Digest 5 (MD5)^{*4} file” indicating the MD5 value for the “content file.” The Music Channel server periodically acquires content from the CP content server via File Transfer Protocol (FTP)^{*5}, and distributes the most recent files to the mobile terminals on the distribution date.

The MD5 value permits the detection of file alteration via external networks, and by acquiring and comparing only the MD5 file when acquiring each program, differences from the previous FTP polling can be detected, thus preventing the wasteful downloading of program content that has not been

updated (Fig. 2 (2)).

4.3 Reserving Programs

The user must reserve a program in order to acquire content. Only programs from sites registered on My-Menu may be reserved, and consequently My-Menu is checked whenever a program is reserved or content downloaded (Fig.2 (3)).

4.4 Traffic Distribution Method

A feature of this service is the ability to reserve a program during the day and download it during nighttime. Given the large amount of information to be downloaded, there is considerable load placed on both the network and system, and therefore a function is implemented in the system to distribute the load when reserving programs.

The system responds to a mobile terminal by providing the timing at which the program is to be downloaded in the form of an expanded HTTP header “X-RPD.” When a program is reserved, the system responds with the computed X-RPD header value so as to distribute the downloading during nighttime (Fig. 2 (4)). The following describes the mobile terminal operations upon receiving the X-RPD header.

*3 ALADIN: A customer management system.

*4 MD5: A hash function (a one-way digest function) generally used with certificates and digital signatures. Since a unique value is assigned to input data, the detection of file tampering during transmission over communications networks (such as the Internet) is possible by comparing the MD5 value before and after transmission.

*5 FTP: A protocol commonly used for the file transfer on TCP/IP networks such as the Internet and intranets.

5. Music Channel Mobile Terminal

This chapter describes the three dedicated Music Channel service applications: the Music Channel menu, the downloader, and the player.

5.1 Music Channel Menu

User actions for the Music Channel include program selection, playback, manual reacquisition, and the display of program information. These actions are all executed from the Music Channel menu.

5.2 Music Channel Downloader

Music Channel service programs are set by using the i-mode browser and subsequently acquired using the dedicated downloader. The following describes how programs are set and acquired.

1) Setting Programs

The user uses the i-mode browser to access the program-setting site from the Music Channel menu or from a bookmark (**Figure 3** (1)). After accessing the program-setting site, the mobile terminal receives the X-RPD header in the HTTP response from the server (Fig. 3 (2)). This X-RPD header indicates the time until the dedicated downloader starts up (downloader start timer) in order to acquire the set program. When the mobile terminal receives the X-RPD header, setting of the program is evaluated as being complete at the

site, and the downloader start timer is then held in the mobile terminal (Fig. 3 (3)).

2) Acquiring Programs

When the downloader start timer has reached the termination, the mobile terminal automatically starts up the dedicated downloader to acquire the set program (Fig. 3 (4)). Even if failure occurs during acquisition of a program, and reacquisition is selected from the Music Channel menu, the dedicated downloader can be manually restarted.

When the dedicated downloader starts up, the program header file is requested (Fig. 3 (5)). The mobile terminal then receives the X-RPD header again with the HTTP response upon acquiring the program header file, with the downloader start

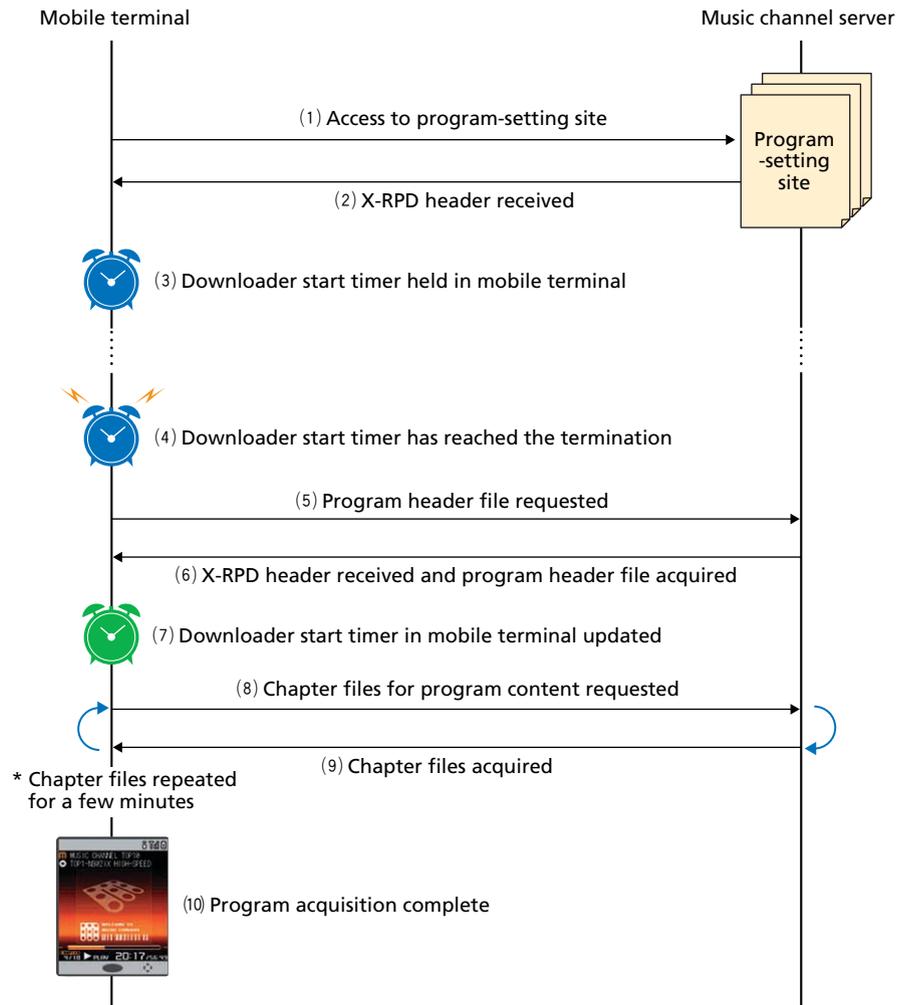


Figure 3 Program setting and acquisition sequence

timer for the next program distribution then being held in the mobile terminal (Fig. 3 (6), (7)).

After acquiring the program header file, the mobile terminal acquires the chapters in sequence from first to last in accordance with the downloaded information for each chapter file written in the program header file (Fig. 3 (8), (9)).

Program acquisition is successful when the last program content has been acquired through the procedure above (Fig. 3 (10)).

When the dedicated downloader starts up automatically for program acquisition and detects that the mobile terminal is outside the service area, acquisition is retried automatically. If program acquisition is not completed within the stipulated number of retries, the program is either illegal or the user has forcibly interrupted acquisition, and program acquisition is assumed to have failed. In this case, the mobile terminal sets the downloader start timer to a time 24 hours from the immediately previous completed time, and waits for an opportunity to automatically acquire the same program again.

5.3 Music Channel Player

Music Channel service programs are played using an enhanced dedicated player.

1) Playing Programs

Programs held in the mobile terminal are selected and

played from the Music Channel menu. In the player, the program configuration is analyzed from the header file, and multiple chapters are played consecutively to reproduce a single program.

Since a program is comprised of multiple chapters, even a program currently being acquired may be played up to the last complete chapter acquired.

2) Restrictions on Playing Programs

The player prevents the playing of programs in response to playback restrictions within the header file, the duration of playback, and information on the maximum number of times that a program can be played. By managing the number of times a program can be played in units of chapters, this number is counted even when the same chapter is being played repeatedly, thus preventing playing of a program more than the stipulated number of times.

6. Conclusion

The Music Channel service system has been developed as DoCoMo's first service using the features of HSDPA for the downloading and enjoyment of large-capacity music content. Efforts to further develop the service and expand content to accommodate video in addition to existing programs and music are now being investigated.