

## Special Articles on Services for Next-Generation Smartphones

# Basic Applications as Access Paths to NTT DOCOMO Services

*In Japan, the transition from feature phones (i-mode phones) to smartphones using Android<sup>TM\*1</sup> OS is accelerating. To make this transition as smooth as possible for users who have grown accustomed to feature phones and to make it easy for them to find and use existing NTT DOCOMO mobile services on smartphones, we have developed a Phone application, Phonebook application, docomo Palette UI and DOCOMO Initial Settings application. This article describes an overview of these basic applications.*

Product Department

**Masashi Tsuboi**

Communication Device Development Department

**Takeshi Ishii****Kaori Otsu****Takuro Maeda****Taeko Yamaki**

## 1. Introduction

The market for smartphones using Android OS is growing rapidly. It is now moving from the “early adopters” stage to the “early majority” stage, and a full-scale transition from feature phones (i-mode phones) to smartphones is gaining momentum. Applications for achieving services geared to smartphones are provided to users through such online stores as Google Play<sup>TM\*2</sup>. However, the great number of similar applications offered by such stores makes it difficult for users to find the services that match their needs, which

is an issue that could easily worsen as the user layer expands in the years to come.

Against this background, we have developed four key applications to enable users who have been using feature phones to make a comfortable transition to smartphones and to make it easier for them to find and use on their smartphones NTT DOCOMO services currently provided on feature phones. These are the Phone application, Phonebook application, Home application and Initial Settings application (hereinafter referred to as “Phone application,” “Phonebook application,”

“docomo Palette UI<sup>®\*3</sup>” and “Initial Settings application,” respectively). In developing these applications, our aim was to achieve applications that exploited convenient smartphone operations while maintaining the high level of services provided on feature phones.

This article explains each of these applications in detail.

## 2. Phone Application

### 2.1 Overview

The Phone application consists of two main functions: a communications function for controlling incoming and outgoing calls and a call-settings func-

\*1 **Android<sup>TM</sup>**: A software platform for smartphones and tablets consisting of an operating system, middleware and major applications. A trademark or registered trademark of Google Inc., United States.

tion for controlling network services such as voice mail. We have designed and developed a new UI for each of these functions, providing screens for dialing a number, for setting a network service, etc

## 2.2 UI for Communications

The UI for the communications function includes separate screens for listing incoming and outgoing calls, for listing favorite numbers, and for dialing a number. We considered that simply providing these screens according to the Android 2.3 standard might cause some confusion in users who had grown accustomed to i-mode phones. In the Android standard, for example, incoming calls history and outgoing calls history are displayed together in mixed fashion—the user is unable to display either type of call history by itself as can be done on feature phones. At the same time, the Phone application of the Android 2.3 standard is a highly stable, mature function, so we decided as a development policy to develop a Phone application by implementing the detailed functions of i-mode phones based on the Android 2.3 Phone application.

The relationship among the new call history screens that we developed is shown in **Figure 1**. This new call history design makes it easy for the user to switch from a list of all incoming and outgoing calls to either an incoming calls history or outgoing calls history.

## 2.3 UI for Call Settings

### 1) Network Service Settings

A settings function is incorporated in the Phone application to simplify the setting of network services such as voice mail, call forwarding call waiting and nuisance call blocking.

Without a settings function, the user would have no other alternative but to dial a special number and make settings manually. The settings function that we developed displays service names and enables the user to make settings simply by selecting the desired operation. The call settings menu is shown in **Figure 2**.

Items that have been set in this way need to be reflected on the network side, and this is accomplished by sending data and signals such as Unstructured Supplementary Service

Data (USSD)<sup>\*4</sup> and Supplementary Service (SS)<sup>\*5</sup> to the network and by passing reply signals from the network to the application side. These data and signals are sent and received via Android's middle layer.

### 2) Other Settings

International settings such as for roaming and international dial assistance as well as prefix settings are provided as a function in the Phone application. International-dial-assist settings, prefix settings, and other types of settings are reflected in a submenu screen as an assist function when making an outgoing call (**Figure 3**). For example, by incorporating a menu for adding an international prefix when making a call overseas, there is no need for inputting a number like “009130010” (the prefix corresponding to WORLD

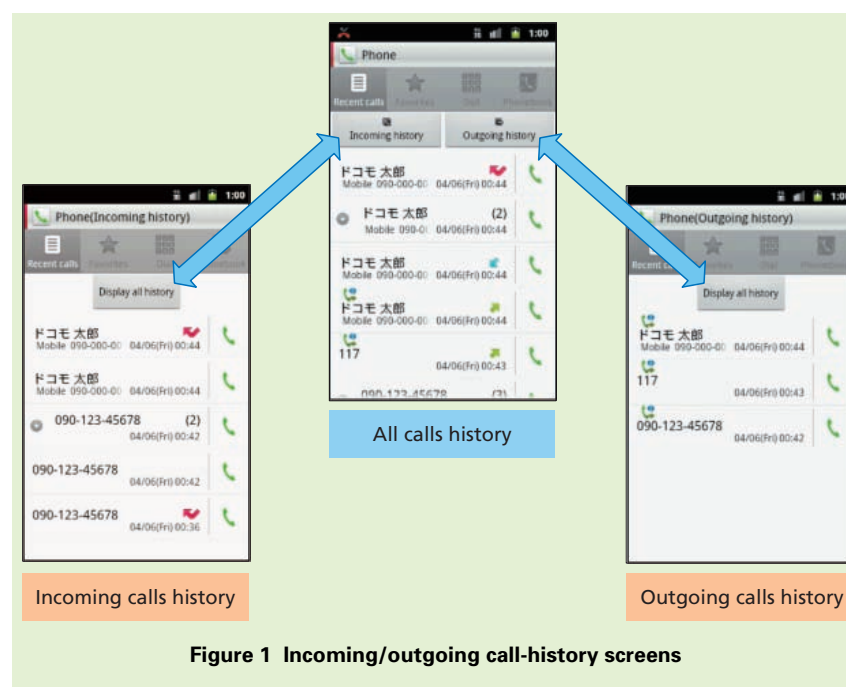


Figure 1 Incoming/outgoing call-history screens

\*2 **Google Play™**: Google Play™ or its icon is a trademark or registered trademark of Google Inc., United States. To receive application-update notifications from Google Play, that application must have been downloaded from Google Play.

\*3 **docomo Palette UI®**: docomo Palette UI is a registered trademark of Nippon Telegraph and Telephone Corp.

\*4 **USSD**: A signal for controlling original NTT DOCOMO supplementary services.

\*5 **SS**: A signal for controlling supplementary services.

CALL, NTT DOCOMO's international call service) every time a call is made.

Feature phones are equipped with a function for adding prefixes as standard, but as Android does not include such a function, we implemented one for the sake of user convenience.

### 3. Phonebook Application

#### 3.1 Overview

There are a variety of phonebook applications in addition to the standard one in Android OS, such as those that are preinstalled in terminals by handset vendors or created by a 3rd party<sup>\*6</sup> and downloaded from Google Play. In comparison to these, the Phonebook application that we have developed has the following three features:

- My Profile<sup>\*7</sup> and group management functions
- Close linking with other applications provided by NTT DOCOMO

- Exchange of name cards via the network

Each of these functions is described in detail below.

#### 3.2 My Profile and Group Management Functions

The My Profile function in i-mode phones is not present in Android 2.3, so we decided to install it in NTT DOCOMO smartphones. A screen shot of the My Profile function is shown in **Figure 4**. This original smartphone function includes the display of name card data that can be prepared by various name-card-creation applications.

Additionally, as a phonebook function that exploits convenient smartphone operations, groups created by the group management function can be displayed using tabs and group members can be added or deleted using a drag-

and-drop action. An example of using the group management function is shown in **Figure 5**.

#### 3.3 Tight Linking with Other Applications Provided by NTT DOCOMO

The linking of the Phonebook application with other applications provided by NTT DOCOMO is shown in **Figure 6**. Linked applications include the Phone application, docomo Map Navi application, Schedule application, Home application, Name Card Creator

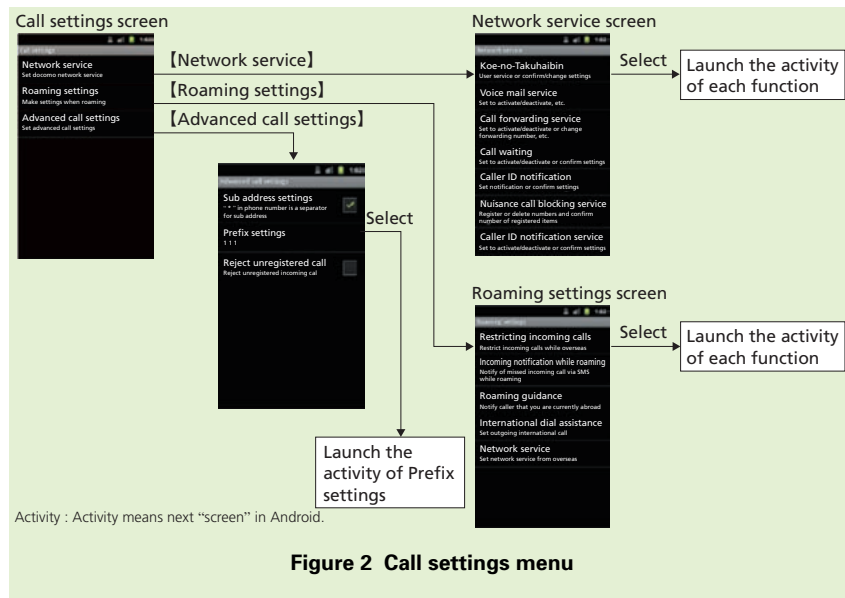


Figure 2 Call settings menu

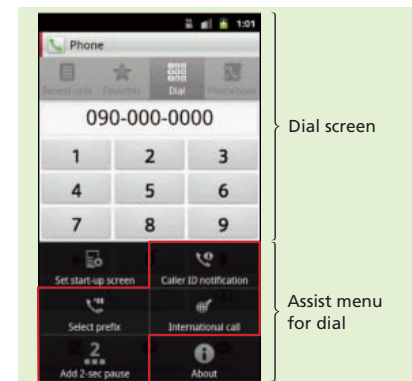


Figure 3 Assist functions on dial screen

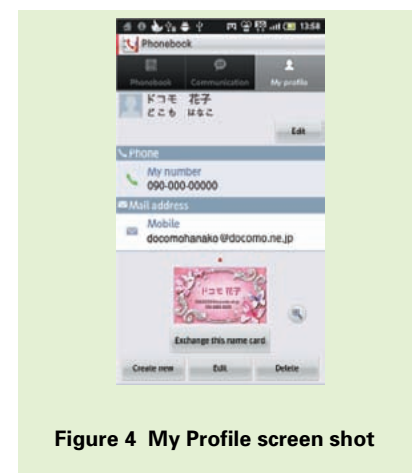


Figure 4 My Profile screen shot

<sup>\*6</sup> **3rd party**: Specialized software vendors that develop software for mobile terminals.

<sup>\*7</sup> **My Profile**: A function that enables the user to register his/her phone number in addition to such personal data as mail address and postal address on the mobile terminal.

application, i-concier application and Infrared application. Any of these applications can be launched from the Phonebook application and conversely, the Phonebook application can be launched from any of those applications. Data can also be exchanged between the Phonebook application and these linked applications.

### 3.4 Exchange of Name Cards via the Network

We developed a function to enable name card data created with a name card application to be exchanged among users via the network. Although name card exchange as commonly used in the past allowed for only one-to-one exchange of name cards, our newly developed system allows for N-to-N simultaneous exchange of name cards (up to 30 people). To perform a name card exchange, the user's current location information and name card data must first be sent to a name-card-exchange server over the network. The

name-card-exchange server then uses the receive time of that name card data and the location information as keys to search for up to 30 candidates who could participate in a name card exchange. It then returns information on the candidates found in this way to the user's terminal so that the user can select which candidates to send name cards to. Since the assumption here is that a name card exchange will be performed indoors, i-area<sup>\*8</sup> is used instead of GPS for obtaining location information.

The sequence beginning with the transition to the name-card-exchange screen and ending with completion of the name card exchange is shown in

**Figure 7.**

#### (1) User registration (login)

The i-area location information and name card data registered in My Profile are sent from the terminal to the name-card-exchange server.

#### (2) Matching

As described above, the name-card-exchange server searches for candidates using data-receive time and location information as keys and returns information on candidates matching those conditions to the terminal. Here, considering the possibility that the number of candidates could subsequently increase, the terminal performs polling<sup>\*9</sup> with respect to the name-card-exchange server over a fixed period of time and receives periodic updates on that candidate information from the server.

#### (3) Name card send

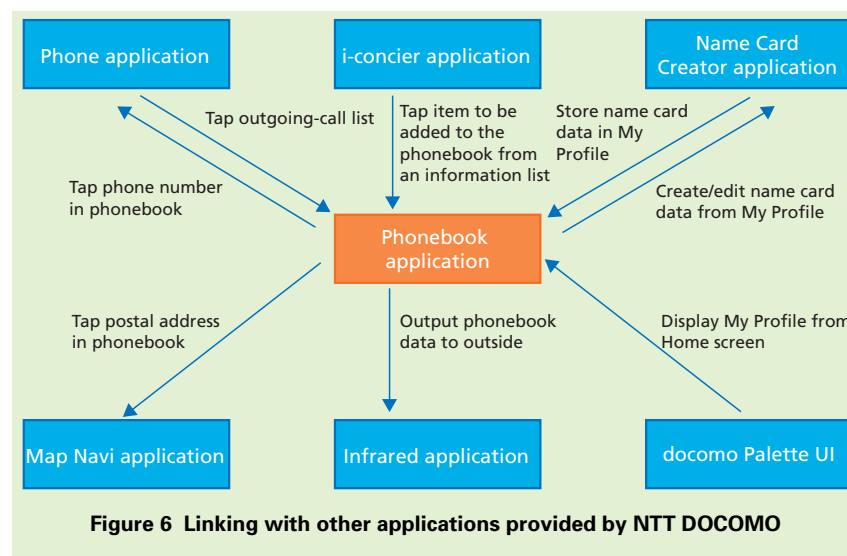
The name card is sent to the party displayed as a candidate on the name-card-exchange screen.

#### (4) Name card receive

If a name card has also been sent from the other party, the data for that name card is downloaded to



**Figure 5** Group management screen shot



**Figure 6** Linking with other applications provided by NTT DOCOMO

<sup>\*8</sup> **i-area:** A function that can provide a smart-phone terminal with its approximate location.

<sup>\*9</sup> **Polling:** The sending of inquiries from a terminal to a server to see if data is available for transmission.

the user's terminal from the name-card-exchange server.

#### (5) Logout

The user presses the “Completed” button to enter a logged-out state.

The UI for name card exchange enables users to exchange name cards in an intuitive manner. That is, it enables a name card to be sent to another party by dragging the image of the name card to the person displayed as a candidate (Figure 8).

## 4. docomo Palette UI

### 4.1 Overview

As an application that the user will definitely encounter when using his or her terminal, the Home application is directly related to the terminal's ease-of-use while also playing an important role as the “face” of the terminal. The UI for launching the various applications installed in the terminal is also achieved by the Home application.

There are various types of Home applications, such as the home application provided by Google<sup>TM\*10</sup> in accordance with the Android standard, the application preinstalled by the terminal vendor to reflect the distinctive features of that terminal, and the Home applications situated in Google Play. The basic configuration of a Home application consists of the following two components:

- Home screen on which widgets and shortcuts to launch applications and

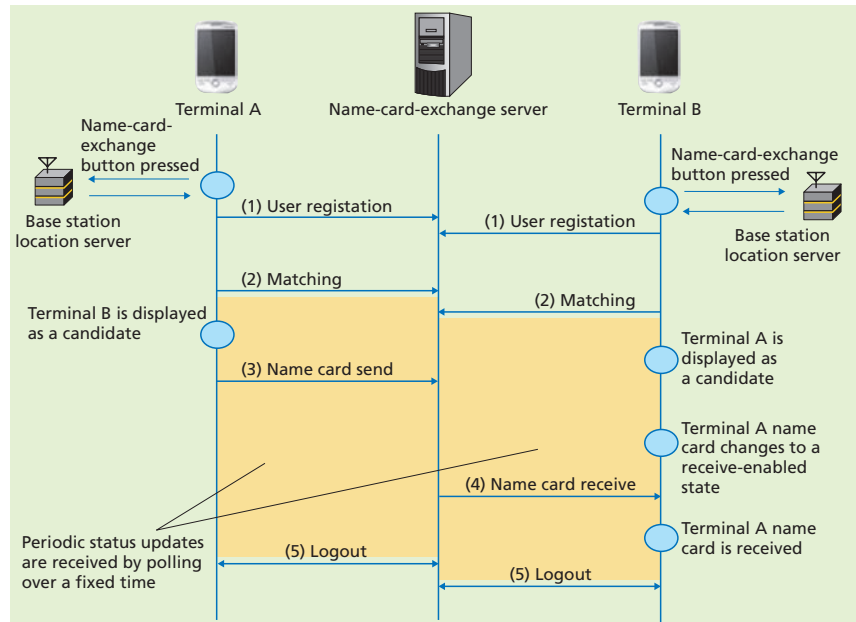


Figure 7 Sequence for name card exchange

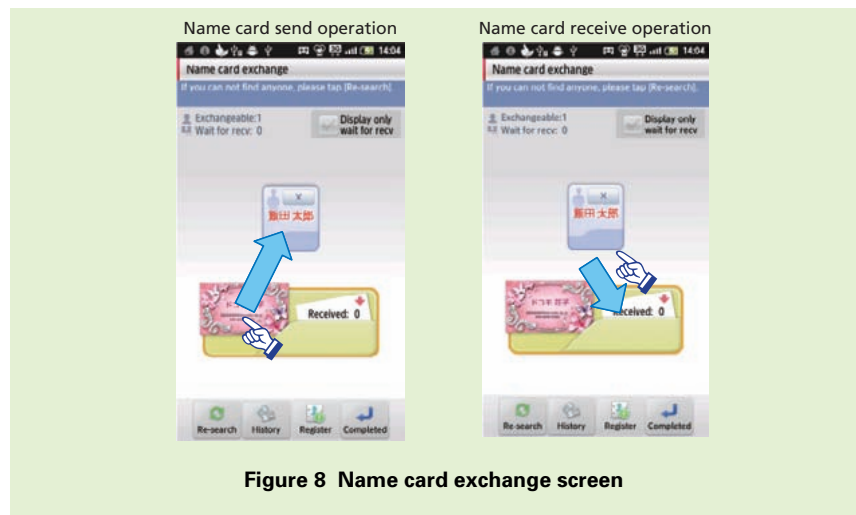


Figure 8 Name card exchange screen

Web pages can be arranged.

- Applications screen displaying a list of icons for launching the applications installed on the terminal.

NTT DOCOMO has been providing “docomo Palette UI” as an original Home application since its 2011 summer

models. The main features of docomo Palette UI are summarized below [1]:

- (1) Access to updated information through a loop structure that enables the user to check all pasted widgets by advancing to the left or right just like changing TV channels (Figure 9).

\*10 Google<sup>TM</sup>: Google<sup>TM</sup> or its icon is a trademark or registered trademark of Google Inc., United States.



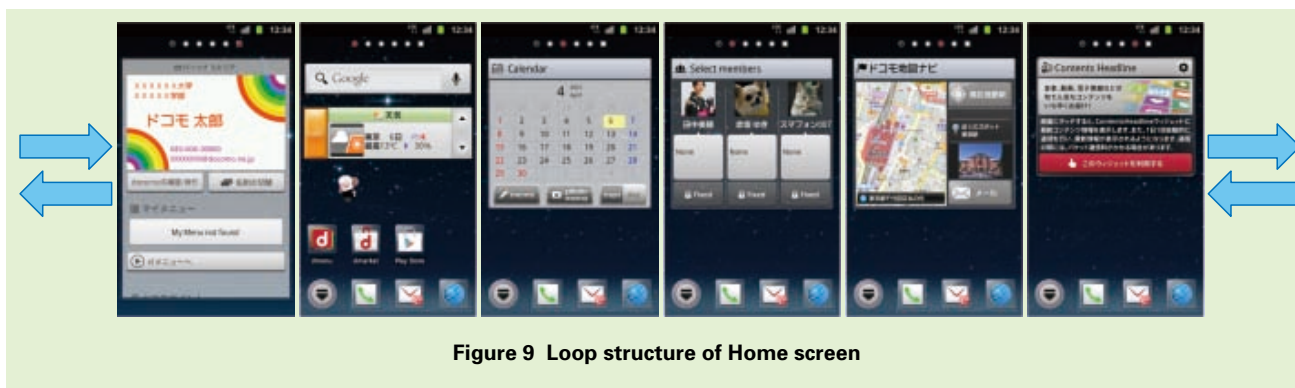
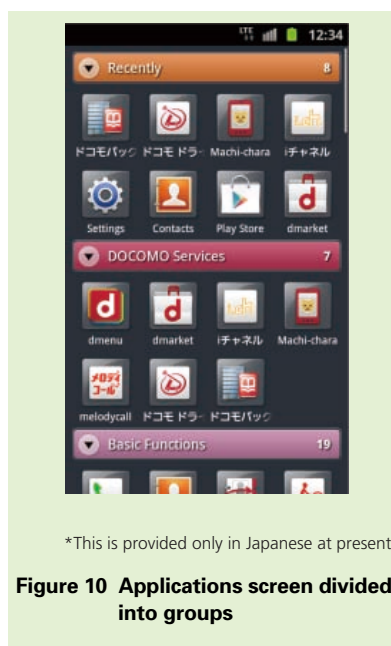


Figure 9 Loop structure of Home screen

- (2) Group-based management of applications on the Applications screen. While preinstalled applications are pre-divided into certain groups the user can also divide downloaded applications into groups, add or delete groups, and change the name of the labels (**Figure 10**).
- (3) High affinity with the existing Android home application so as to provide an easy-to-use Home application for users new to smartphones as well as users accustomed to Android.



\*This is provided only in Japanese at present.

Figure 10 Applications screen divided into groups



\*This is provided only in Japanese at present.

Figure 11 Personal Area for displaying user information

## 4.2 docomo Palette UI Added Functions

The following functions were added to docomo Palette UI starting with NTT DOCOMO's winter/spring 2011-2012 smartphone models to strengthen the link with NTT DOCOMO services:

- Personal Area
- Widgets for NTT DOCOMO services
- Kisekae function

### 1) Personal Area

A screen shot of the Personal Area

for displaying user information is shown in **Figure 11**. This screen collects user-related information in one place. It displays or provides access to (1) My Profile, (2) docomoID checking and issuing, (3) My Menu, (4) DOCOMO points (5) currently subscribed NTT DOCOMO services and (6) fee checking. This layout makes it easy for a user to check and use personal information that had previously been difficult to access and understand in smartphones.

Considering that the Personal Area is a special location for dealing with user information, we implemented it using a widget providing a higher level of convenience compared with ordinary widgets. Specifically, we enhanced our Home application and AppWidget<sup>\*11</sup> functions in a manner outside the Android standard framework to enable vertical scrolling. Furthermore, in contrast to a typical Home screen on which icons for application-list, phone, mail

\*11 **AppWidget**: An application pasted and resident on the Home screen.

and browser functions are displayed at the bottom (in a section called the “Dock Area”), the screen for the Personal Area displays no Dock Area so that information can be checked across the entire screen.

## 2) Widgets for Various NTT DOCOMO Services

Widgets were developed for various services and pasted on docomo Palette UI to promote the use of NTT DOCOMO services. These include widgets for i-channel<sup>\*12</sup>, Machi-chara<sup>\*13</sup>, Schedule/ memos and Phonebook.

## 3) Kisekai Function

The Kisekai function provided on

i-mode phones has been implemented on smartphones. This function enables graphic designs like wallpaper and icon backgrounds to be changed so that users can customize their smartphones as they see fit (**Figure 12**).

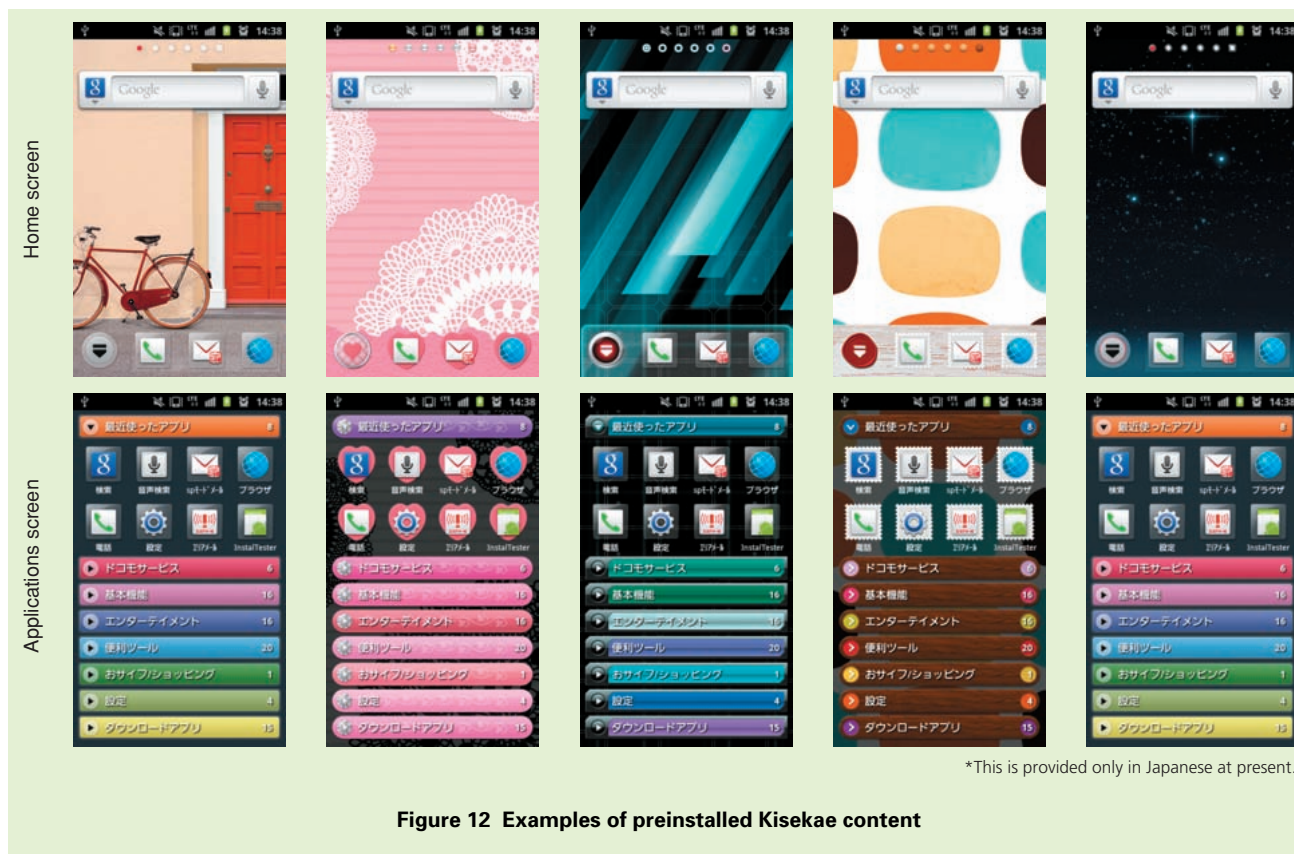
In addition to using preinstalled Kisekai content, users can also download desirable graphic designs from the dmenu portal and the Internet. Such content can be encrypted as necessary. Kisekai content can also be created using the Kisekai Tool provided by NTT DOCOMO. This tool has been released not just for content providers but also for general users so that anyone can create and even distribute Kisekai

content [2]. Content can be encrypted using the Kisekai creation tool for the sake of copyright protection and to prevent misappropriation of content.

## 4) Lock Screen

The lock screen is a necessary point of contact for users when using smartphones. This screen has been designed to enable a Machi-chara character and Dock Area to be displayed as on docomo Palette UI so that the user can check the number of unanswered incoming calls and unread mail items and read i-concier messages.

An example of a lock screen linked with docomo Palette UI is shown in **Figure 13**. The content of the lock



**Figure 12** Examples of preinstalled Kisekai content

<sup>\*12</sup> **i-channel**: An information delivery service for NTT DOCOMO users that displays diverse and updated information in relation to news, weather, fortune telling, music and magazines, etc.

<sup>\*13</sup> **Machi-chara**: A service that displays a character that is chosen by the user on the standby

screen or menu screen of a mobile terminal.



\*This is provided only in Japanese at present.

**Figure 13** Screen shot of lock screen linked with docomo Palette UI

screen is linked with docomo Palette UI so that no inconsistencies arise between the lock screen and the content displayed on docomo Palette UI when the user releases the lock.

## 5. Initial Settings Application

Applications that are not the target of initial settings under the Android standard must be set individually at the time of their initial use. This would normally require complex operations on

the part of the user.

NTT DOCOMO services are not targeted by initial settings under the Android standard, and to therefore simplify user operations, we have developed an Initial Settings application that enables settings to be made in batch for functions used in common by NTT DOCOMO services.

The Initial Settings application starts up when making initial settings for the Android terminal. Specifically, it starts up after initial settings under the Android standard and initial settings established by the terminal vendor have been made. The Initial Settings application enables settings to be made with regard to (1) the application manager, (2) FeliCa<sup>\*14</sup>, (3) docomo application password and (4) location provision. A settings-completion notification is issued once these settings have been completed. The application will not be started up again unless a terminal initialization (reset) is performed.

## 6. Conclusion

This article described the Phone

application, Phonebook application, docomo Palette UI and Initial Settings application developed for NTT DOCOMO's winter/spring 2011-2012 smartphone models. We developed basic applications to provide access paths to NTT DOCOMO services and to help users who had grown accustomed to feature phones to make a smooth transition to smartphones. Looking forward, NTT DOCOMO intends to listen carefully to smartphone users with the aim of responding quickly to user needs to areas requiring improvement and to the demand for new services.

## REFERENCES

- [1] T. Yamaki et al.: "Application Functions for Winter/Spring 2011-2012 Models," NTT DOCOMO Technical Journal, Vol.13, No.4, pp. 4-14, Mar. 2012.
- [2] NTT DOCOMO: "docomo Palette UI Kisekai Content Creation Tool" (in Japanese).  
[http://www.nttdocomo.co.jp/service/developer/smart\\_phone/service\\_lineup/palette\\_ui\\_kisekai/tool/](http://www.nttdocomo.co.jp/service/developer/smart_phone/service_lineup/palette_ui_kisekai/tool/)

\*14 **FeliCa**<sup>®</sup>: A contactless IC card technology developed by Sony Corp. A registered trademark of Sony Corp.