Corporate Solutions | SMS | Communications Module

Technology Reports

SMS Center Push Service Infrastructure for Enterprise Solutions

There has been increasing need recently for new functionality in enterprise solutions, such as sending messages from corporate servers to mobile terminals, or monitoring and controlling smartphones and equipment connected to a communications module. To implement such functions, we have developed an infrastructure able to send text and control SMS messages from corporate systems to FOMA terminals or vehicles equipped with FOMA communications modules. We have also begun providing an SMS Center Push service. This functionality enables us to support a variety of corporate-user business needs.

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1. Introduction

Recently, with corporate solutions that use mobile terminals and communications modules, there has been increasing need to send messages directly from corporate-user equipment to FOMA terminals through the NTT DOCOMO network, and to conduct remote monitoring and control of smartphones and devices equipped with FOMA communications modules.

NTT DOCOMO has already developed mobile device management solutions such as "Business mopera Anshin Manager®*1," and "Business mopera Command Direct®*2." Specifically, this first service allows a mobile terminal to be locked or data to be erased remotely by the user or upon request from corporate-user facilities, for example, when an employee's mobile terminal is lost. The second allows phone book or other i-mode settings to be changed remotely. However, while these services can be introduced quickly and inexpensively, they are not a flexible enough solution to meet individual user requirements.

To diversify the corporate solutions offered by NTT DOCOMO, we have begun offering an SMS*3 Center Push Service. To initiate this service, we developed infrastructure functionality able to send text SMS messages (hereinafter referred to as "text SMS") and control SMS messages (hereinafter referred to as "command SMS") to FOMA terminals, FOMA communication modules installed in vehicles or construction machinery (hereinafter referred to as "machinery"), or to PCs from corporate-user equipment. Message formats are customizable for each corporate user.

In this article we provide an overview of the SMS Center Push service and its functionality.

2. Service Overview

2.1 Services Provided

The SMS Center Push service is

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*1 **Business mopera Anshin Manager®**: A management service for safe and secure operation of corporate mobile terminals. Enables various configuration and control operations for company mobile terminals used by employees to be done from a PC (management Web site).

able to send SMS messages from an SMS transmission center at the user's facility (hereinafter referred to as "push client"), to specific phone numbers. The push client is connected to the SMS Gateway (GW) on the NTT DOCOMO network by Internet Virtual Private Network (VPN) [*4] or a dedicated line. An example of a system architecture using SMS Center Push is shown in **Figure 1**.

The new service can be introduced more quickly than previous services, which required push clients to be specified and built individually for each customer, by generalizing the interface between push client and the SMS-GW and providing it as a platform service. Providing a common interface also improves usability.

2.2 Service Features

The main features of the SMS Center Push service are described below.

- Supported SMS formats

  Both text and control SMS messages are supported.
- Segmented transmission

  Messages that are too long are segmented into multiple SMS messages for transmission.
- Generalized interface

  SMS messages suited to the particular solution can be transmitted by specifying SMS parameters.
- Support for international roaming

  SMS messages can be sent whether the destination FOMA mobile device is in an international roaming area or within Japan.

2.3 Service Introduction Scenario

The SMS Center Push service is designed for the following types of scenarios.

- Corporate users desiring to remotely monitor and control vehicles or machinery equipped with FOMA communications modules, retrieving data such as location.
- Corporate users desiring a mechanism enabling managers to perform remote operations to prevent data leakage from PCs or smartphones removed from company premises, such as locking or deleting data.

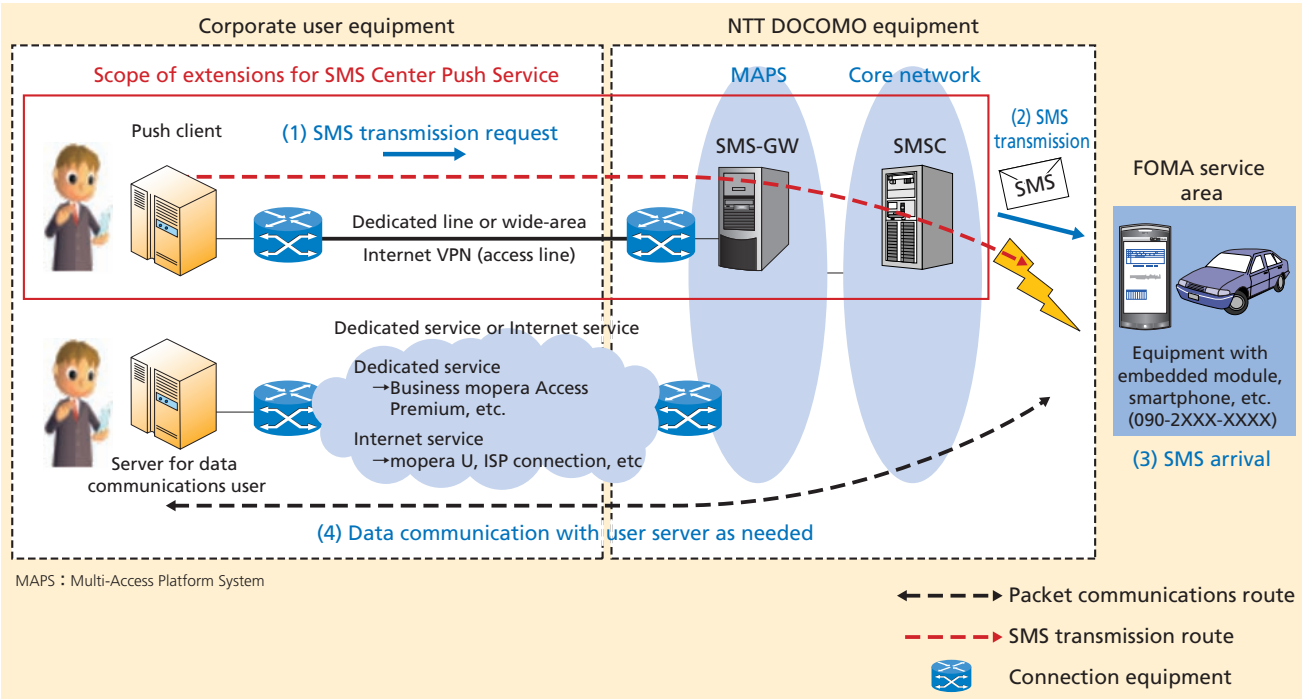

Figure 1 Example structure of a system using the SMS Center Push service

*2 **Business mopera Command Direct®**: A service that allows control service functions for NTT DOCOMO mobile terminals to be added to corporate systems or software products.

*3 **SMS**: A service for sending/receiving short text-based messages mainly between mobile terminals.

*4 **VPN**: A virtual network that establishes a logical connection between IP equipment of the same service.

- Corporate users desiring a means of contacting employees rapidly for broadcast messages, confirming employee safety, or other purposes.

Individual solutions such as the above can be provided using the same interface.

3. SMS Transmission Function

3.1 SMS Transmission Overview

With the SMS Center Push service, a push request sent from the push client is received by the SMS-GW is delivered to the SMS Center (SMSC), passes through the core network, and is transmitted to the smartphone or device with embedded communications module. An overview of SMS transmission is shown in **Figure 2**. Note that the connection between the corporate-user equipment and the SMS-GW is provided by the corporate-user, according to the needs of the user.

3.2 SMS Gateway Overview

1) Push Client Interface

To receive and respond to SMS transmissions from the push client, extensions were added to the SMS-GW interface on the SMS-GW. This enables it to receive SMS messages in both control and text formats as specified in parameters at the push client. The interface is also equipped with a function allowing undelivered SMS messages accumulated within the NTT DOCOMO network to be canceled, for example, when a FOMA mobile terminal is out of range, and a function that notifies the push client when an SMS transmission has completed.

The push-client interface uses the HyperText Transfer Protocol (HTTP). The specification for the SMS-GW push-client interface is shown in **Table 1** and an example of the push request format when sending an SMS message is shown in **Figure 3**.

2) SMS Transmission Function

When the SMS-GW receives a push

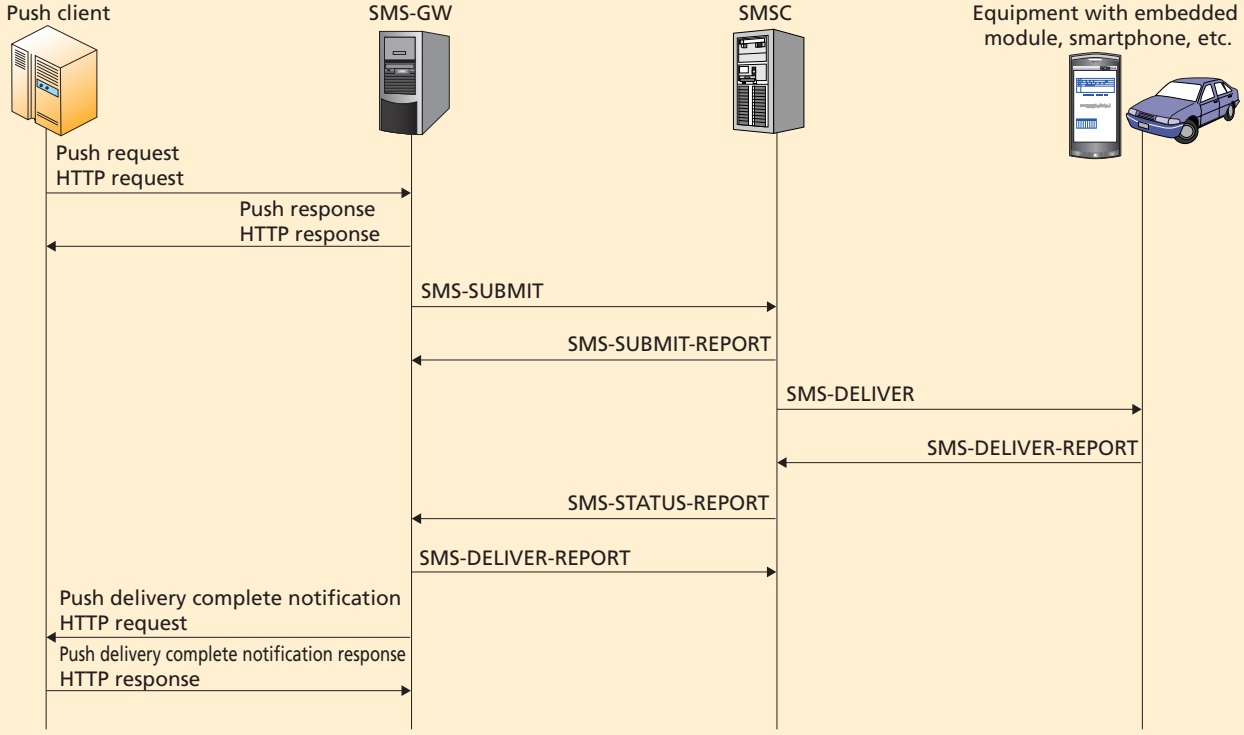

Figure 2 SMS transmission overview

request from a push client, it determines whether it is for a control or a text SMS from the request contents, adds information required to generate the SMS, and creates a request to send to the SMSC.

- Segmented transmission function

When the SMS-GW receives a push request from a push client, it checks the size of the message, and if the data in the request parameters exceeds a certain size, the SMS-GW divides the push request into segments before sending it to the SMSC. The SMS Center Push service limits the number of segments per request to ten, and an error response is returned to the push client and no message is sent if the message exceeds ten segments. Segmented transmission can be enabled or disabled, using a segmentation flag in the push-client registration function, by specifying the XPID[*5] as the svcid parameter of the request.

Table 1 Push client SMS-GW interface specification

Process name	Event name
Push transmission	Push request
	Push response
Push cancellation	Cancellation request
	Cancellation response
Push delivery complete notification	Push delivery complete notification
	Push delivery complete notification response
Cancellation delivery notification	Cancellation delivery notification
	Cancellation delivery notification response

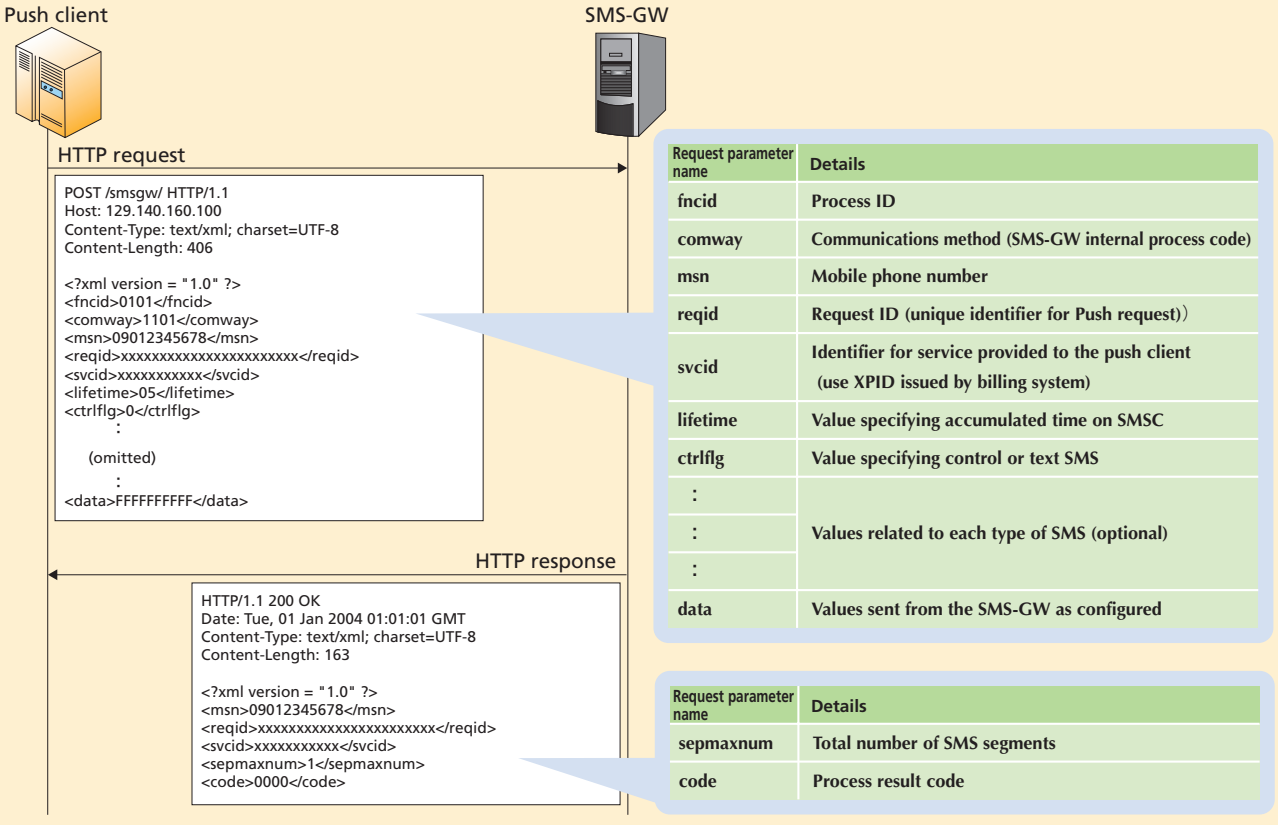

Figure 3 Example push request format for sending SMS (for a control SMS)

*5 **XPID**: An 11-digit code used to uniquely indicate a service and service provider within the NTT DOCOMO billing system.

- Service instruction value specification function

  In considering usages of this service in a variety of solutions, this service should be controlled based on various line states, such as roaming internationally or suspended. Therefore, the SMS-GW was made possible to specify the method estimating the line state at the SMSC. Various service instruction values, based on the line state, are shown in **Table 2**.

  The function makes it possible to select whether SMS messages will be sent or not, with the state determined through the core network when a push request is received.

  This function is handled by NTT DOCOMO based on only the information configured when the push client is registered, so it can only be configured per XPID, as with segmented transmission.
- Push cancel function

  This function implements a push cancel that can be issued explicitly from the push client while the SMS message is being transmitted, from the time when the push is requested until the SMS arrives at the mobile terminal. The SMS cancel can be issued per SMS transmit request, using the mobile phone number (msn) and request ID (reqid) as the key, as shown in Fig. 3. Any SMS message can be canceled, whether a control or text message, and whether segmented or not. The SMS-GW sends a cancel request to the SMSC when it receives a cancel request.

3) Destination Phone Number Authentication Function

SMS messages can only be sent to telephone numbers indicated in the SMS Center Push contract. The SMS Center Push contract ties telephone numbers to XPIDs, and at most ten XPID may be associated with a given telephone number.

3.3 SMS Delivery Function

In the SMS delivery infrastructure, functionality is divided between the SMS-GW and the core network, so it was implemented to minimize the number of functions requiring additional development any time functionality is added in the future. In the SMS-GW, delivery control conditions are managed for each solution as service instruction values, as shown in Table 2. On the other hand, the function that controls SMS delivery on the core network is specialized and linked to the latest state of the user's mobile terminal.

In developing the new service, we extended the interface to allow delivery control instructions to be sent to the core network, in order to enable delivery of push services initiated from corporate users' equipment to be controlled based on various line states (such as roaming internationally, suspended, exceeded usage limits, etc.). This is already possible with push services initiated within the NTT DOCOMO network.

Table 2 Service instruction value based on line state

Delivery control condition	Overview	Applicable line state
Whether delivery while roaming out is possible or not	Flag determining whether to deliver while roaming outside the core network	While roaming internationally
Whether under restriction by operator	Flag determining whether to deliver for lines that have been suspended	While line use is suspended
Whether call-blocking is active	Flag determining whether to deliver based on SMS spam blocking settings	While configured to block spam SMS
Whether limits have been exceeded	Flag determining whether to deliver to limit-plan clients that have exceeded their limit	While limit has been exceeded
Whether PS roaming-out	Flag determining whether to send SMS message by circuit-switched network, based on network operator information	While roaming out of the packet network

PS : Packet Switching

The organization of the SMS delivery infrastructure is shown in **Figure 4**. The SMS-GW executes a function specifying the service instruction value, and sends SMS transmission requests to the SMSC with attached information indicating the SMS delivery control for each solution, according to service instruction value (Fig. 4(1)). When the SMSC receives the SMS transmission request, it passes the SMS delivery control instructions through, sending the SMS delivery request to the GMSC (Fig. 4(2)). When the GMSC receives an SMS delivery request, it queries the HLR to obtain the state and profile information regarding the destination user (Fig. 4(3)). When the destination query completes, the GMSC uses the configured SMS delivery control instructions to make a judgment (Fig. 4(4)), and controls delivery of the SMS accordingly.

With these functional extensions, the core network receives the service instruction value as a parameter of the SMS request from the SMS-GW, so delivery of the SMS message can be controlled based on specified service instruction value.

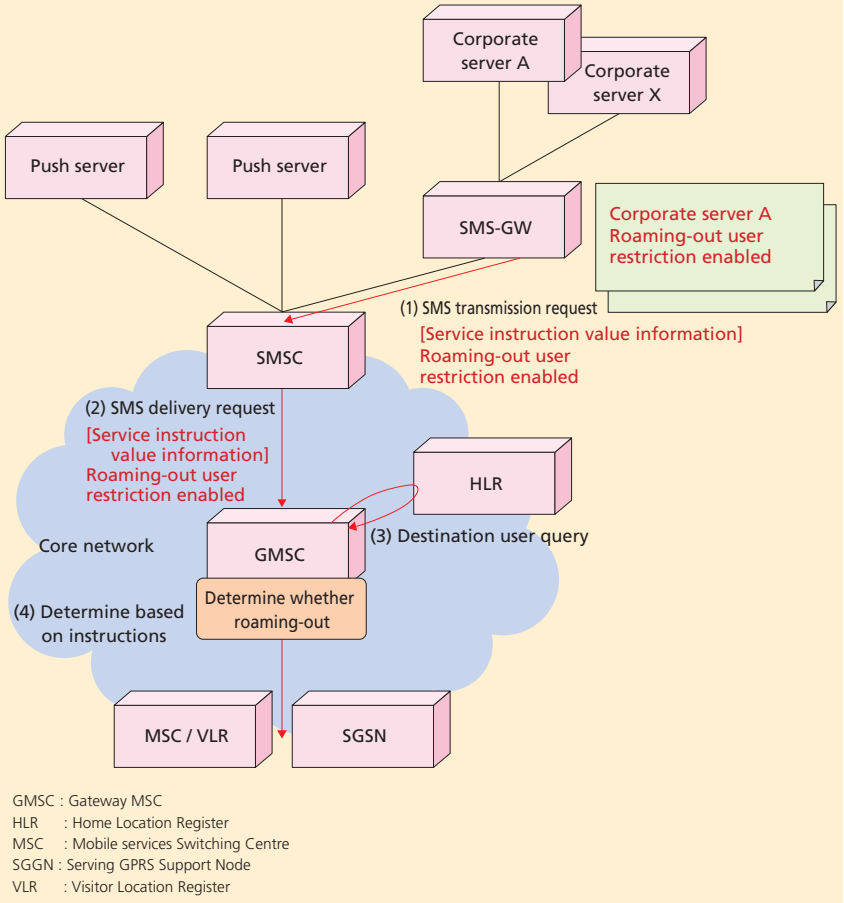

Figure 4 SMS delivery infrastructure

4. Operations Functions

4.1 Push Client Registration

In developing this functionality, we needed to offer a flexible SMS transmission function while also preventing distribution of junk SMS messages, so we implemented a push client registration function which limits use of the service to the user's originally intended purpose when applying to NTT DOCOMO.

The push-client registration function registers information about the user's corporate system on the SMS-GW, using an operations command issued from an NTT DOCOMO maintenance terminal. This registration is done at NTT DOCOMO, using an XPID issued by the NTT DOCOMO billing system as the key.

4.2 Billing Log Output Function

A log of the results of SMS transmissions through this service is compiled, and can be made available to the user as billing information. Data is compiled according to XPID, with daily logs of SMS transmission results totaled on the SMS-GW, and the monthly total number of SMS messages sent to the billing system at the beginning of each month. Invoices can be issued from the billing system by linking with this system.

5. Conclusion

We have developed an SMS transmission infrastructure for corporate users and begun offering an SMS Center Push service as infrastructure functionality for providing more diverse solutions to NTT DOCOMO corporate customers. This enables functions such as remote control of equipment with embedded communications modules, remote security locking of smartphones, and rapid contact with employees, and makes it possible to provide business support for corporate users in a variety of situations.

In the future, we will continue to support our corporate users, extending functionality so that even more corporate users adopt the SMS Center Push service and creating a broad menu of corporate solutions that can be installed more rapidly.