HEADING FOR MULTIMEDIA MESSAGE SERVICE IN 3G

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Abstract

With the operation of General Packet Radio Service (GPRS) and emergence of Third Generation (3G) networks, the demand for the broadband wireless service is massively increased. Standard value-added services such as voice mail, Short Message Service (SMS) have been extended to some richer data exchange services which include email access and Multimedia Message Service (MMS).
With MMS which is an evolution of SMS, the multimedia contents – text, images, audio clips and even video clips – can be exchanged between any GPRS/3G subscribers. The message can be constructed by GPRS/3G-supported mobile phones and submitted within a few seconds, which is the conventional way to use this messaging service. More conveniently, protocols can be used such as HTTP, SMTP to provide access to this service too.
A practical implementation of MMS is addressed in this paper. Various protocols are supported by this MMS Gateway for inbound and outbound message transaction. This MMS Gateway is considered as a quick-response, stable and scalable MMS system, enabling the easy exchange of multimedia contents between Internet users and GPRS/3G subscribers. The architecture of this MMS Gateway is depicted in this paper and the features of this messaging system are presented.

1 Introduction

As an improvement of the universal messaging service and an evolution of SMS, Multimedia Messaging Service, commonly known as MMS, builds up from SMS, email and multimedia technologies [1]. Multimedia contents can be exchanged between users within a few seconds as long as GPRS/3G coverage is available. Similar to the SMS, messages are held by the network when the recipient is temporarily not reachable, and delivered shortly after the recipient re-appears in the network.
The MMS message is constructed as a series of slides. Each slide can be composed of text, images, audio/video clips that are then organized by a predefined graphical layout and slide transition timing is also applied.
MMS is emerging to be the next mass market data application for world-wide wireless communication. The MMS contents can be sent between different GPRS/3G networks as easily as SMS messages routed in GSM. Unlike SMS which limits the length of short message to 160 bytes, the multimedia message is allowed to have an arbitrary size. However, the maximum size of one multimedia message as well as its cost still depends on the network provider [2].
MMS is a two-way messaging service. With the latest model of MMS supported handsets, multimedia messaging is no more complex than SMS. Moreover, the MMS message can be sent from a PC to a mobile and vice versa. These messages are maintained and transmitted by MMS Centres (MMSC). The MMSC functions as a relay to store and forward the messages. MMS messages are routed by multiple MMSCs to the recipients. Some confirmation messages such as Delivery Report messages are also originated and routed by the MMSC and delivered to the senders of the MMS messages.
The 3GPP specification[3], indicates that the MMSC exposes different interfaces for the transaction of multimedia messages. The messages can be composed in the format of Email and submitted using SMTP, or they can be sent directly through HTTP in a specified format. All these transaction protocols make the creation of MMS much easier and more convenient than finger typing on the mobile handset.
A new MMS Gateway has been developed that aims to provide quick-responses, provide a stable and scalable MMS system and also act as a gateway to conveniently bridge the internet and high bandwidth cellular networks,. The rest of this paper is organised as follows. The architecture of this MMS Gateway is described in section 2. Section 3 focuses on its outstanding two-way messaging functionality. The conclusion is given in section 4, along with a brief discussion on the challenge in 3G networks.

2 Architecture of MMS Gateway

This section details the MMS Gateway design, and some of the essential features are described. Figure 1 illustrates the key components of this MMS system.

2.1 Clustering servers

Considering the massive demand of multimedia contents and the delivery expected in 3G networks, the MMSC must be highly scalable and reliable in order to guarantee the instant response and successful transaction for every single request. This MMS Gateway is built with clustering features utilising J2EE architectures. Using JBoss3.0 [4] which is a J2EE

application container, the gateway is deployed into a cluster where multiple member nodes are connected. The traffic load is balanced over these nodes to avoid any loss of requests in a high traffic-load situation. The downtime of any node can be monitored and the new member can be automatically discovered. With the advantage of farming technology, this MMS Gateway can be hot-deployed into one of the member nodes then automatically cluster-widely distributed. The clustering features allow the technicians to easily maintain, update and also recover the system.

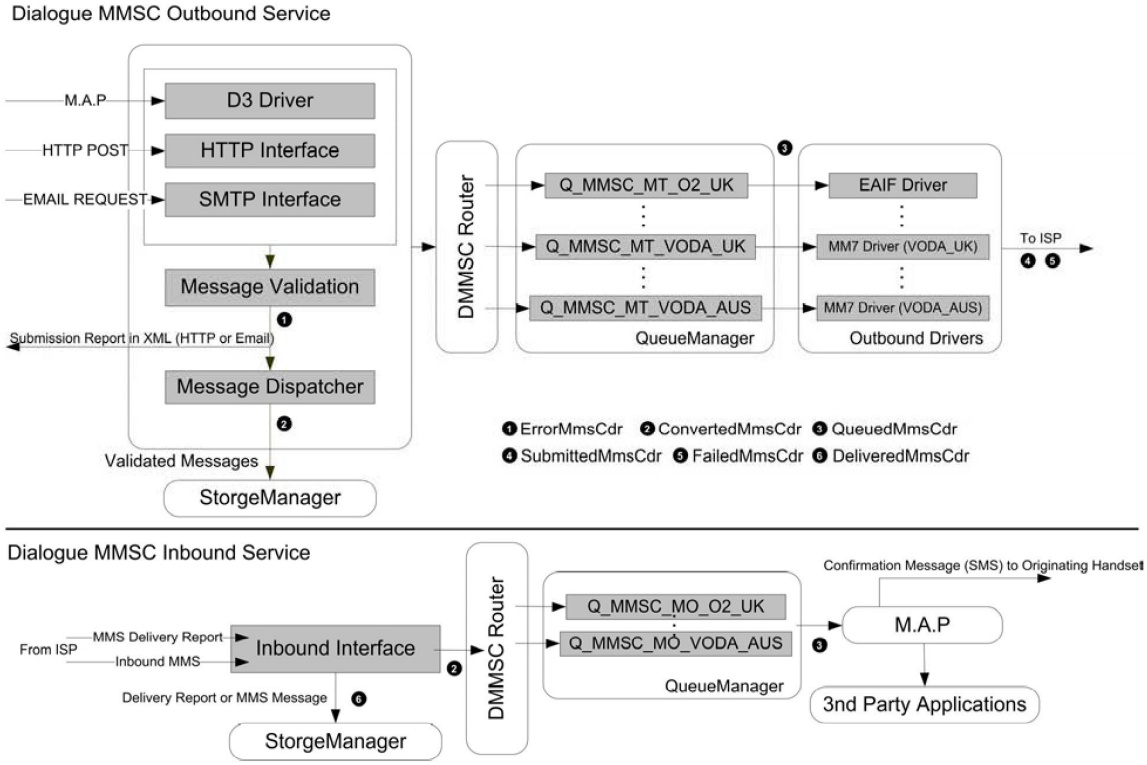

Fig. 1 Architecture of MMS Gateway/Outbound and Inbound MMS Services

2.2 The core components of MMS Gateway

The information that is received with each submission request, such as subject, expiry date etc...is validated by the Message Validation module. The multimedia contents with unsupported Multipurpose Internet Mail Extensions (MIME) types are also filtered out when they reach any of the interfaces for the outbound transaction. This MMS Gateway currently connects to several Internet Service Providers (ISPs) through an External Application Interface (EAIF) or MM7 [1] interface. The MMS Gateway also logs a Call Data Record (CDR) within a plain text file at several specific stages during the inbound/outbound transaction so that the details of any error, failure and other status of the processing can be tracked by customers and technical supporters. The CDR is also used by the billing system so that the service can be charged at different rates according to the stage of the transaction. Six types of CDR are defined to indicate six stages/statuses, as shown in Figure 1. Table 1 gives a brief description for each type of CDR.

2.3 Essential components of MMS Gateway

The Queue Manager (QM) and the Storage Manager (SM) are two essential components integrated with the MMS Gateway for routing messages and managing message contents, respectively. The QM is implemented within the JBoss framework, and takes advantage of features like failover, distributed processing and load balancing. An XML formatted file is used for the routing configuration by the Router module. The snippet in Table 2 gives an example configuration for the inbound routing. Each queue is a collector of certain messages whose recipient addresses match the specified pattern, it is also associated with a submission driver or an external application. The queued items can be managed according to a set of configurable policies, such as First In First Out (FIFO). The QM sends a notification to its driver or the application when a message is queued to trigger further procedures. The transaction details and all the multimedia contents (includes Slide information) that are contained in the inbound MMS, the outbound submission request, as well as the MMS Delivery Report are stored into a database by the SM. This allows the contents to be re-used by customers or further processed by Third Party Applications which will be very popular in the 3G market.

3 Two-way MMS Services

The Two-way MMS services are supported by this MMS Gateway to offer a variety of different ways to bridge the Internet users and GPRS/3G subscribers. The architecture of outbound/inbound MMS services is illustrated in Figure 1.

MMS CDR	Description
ErrorMmsCdr	The submission request can not be validated
ConvertedMmsCdr	The valid message has been processed and dispatched to route engine
QueuedMmsCdr	The route engine has spooled the message into a specific queue
SubmisttedMmsCdr	Message has been submitted to the network operator
FailedMmsCdr	The message failed in submission to the network operator
DeliveredMmsCdr	Delivery report is returned from the network operator

Table 1. Description of MMS CDRs

```
<StaticRoutes>
  <MO>
    <Collector msisdn="6132432432">
      <Queue>MMSC_MO_VODA_AUS</Queue>
    </Collector>
    <DefaultCollector>
      <Queue>MMSC_MO_O2_UK</Queue>
    </DefaultCollector>
  </MO>
</StaticRoutes>
```

Table 2. Example of the configuration for inbound routing

3.1 Outbound MMS Service

HTTP Interface

The HTTP interface supports four ways to deliver contents. The multimedia contents can be posted individually or as a single .zip format file in the HTTP POST body. Furthermore, the message can be submitted by simply passing an URL which points to a content file (.zip file), and the contents can also be retrieved by providing the ID of the record in the Storage Manager if a message containing the same contents has been submitted before. A Submission Report is returned in XML format through HTTP to inform the customer of the status of the submission. Table 3 shows an example of a HTTP request and the resulting Submission Report.

```
HTTP://mms.dialoguesubmissionurl.co.uk/MT/SUBMIT?X-
MMS-Account=account&X-MMS-Organiser=test&X-MMS-
Password=mypassword&X-MMS-
Recipients=07798788888&X-MMS-
OriginatingAddress=88888&X-MMS-
Subject=This+is+the+subject&X-MMS-
VaspTransactionId=1085065430485&X-MMS-
ContentLocation=HTTP%3Awww.dialogue.co.uk%3A8080%
2Frepository%2Fsubset.zip

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE MmsTransaction>
<MmsTransaction>
        <VaspTransactionId>8976789</VaspTransactionId>
        <TransactionId>345535</TransactionId>
        <StorageItemId>23423424</StorageItemId>
        <StatusCode>1000</StatusCode>
        <StatusText>Success</StatusText>
        <Messages>
            <Message>
                <Recipient>07798788888</Recipient>
                <MessageId>11111111</MessageId>
                <StatusCode>1000</StatusCode>
                <StatusText>Success</StatusText>
            </Message>
        </Messages>
</MmsTransaction>
```

Table 3 Example of a HTTP request and the resulting XML-formatted Submission Report

SMTP Interface

The MMS Gateway also provides a Simple Mail Transfer Protocol (SMTP) interface to offer the authorised clients the ability to submit the MMS by email. By sending an email to the recipient, using the email format of Receipient-Number@mms.dialogue.com, the email subject is then converted to the subject of the MMS the body of the email is converted to the text format content of the MMS, and all the attachments are then validated by the gateway and encoded into the MMS. The Submission Report, that contains the details of the successful submission or any failure, is emailed back to the originating email address. If the message is properly converted to MMS and delivered to the ISP, the customer will receive a second email containing the Delivery Report. The SMTP and HTTP outbound services are illustrated in Figure 2.

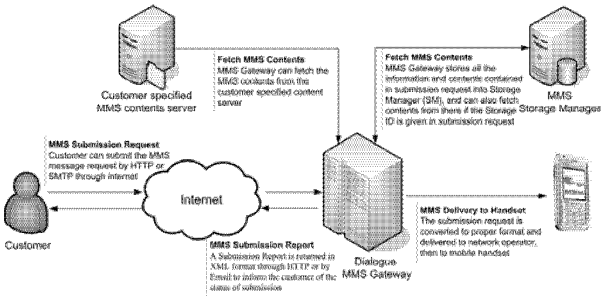

Fig. 2 MMS Outbound Services

D3 Interface

The MMS Gateway is also connected, by D3 Interface, to an online mobile messaging system, the Mobile Application Portal (M.A.P)[5]. With the aid of the online system, the multimedia messaging application can be organised into campaigns. Message contents can be uploaded and organised by the built-in content manager system which stores the contents into libraries and automatically adapts them for different handsets if required. The M.A.P service is aimed at non-technical users to provide an easy-to-use

messaging system, it also provides a comprehensive reporting and tracking approach to users.

3.2 Inbound Service

When the incoming MMS arrives at the inbound interface, it is decoded and routed to M.A.P for further processing. The MMS reception can be done by M.A.P by setting up an Inbound MMS Campaign. All the contents (includes SMIL presentation) can be viewed and managed in this campaign.
When the inbound message has been properly handled by M.A.P, a SMS message is sent back to the MMS originating handset to indicate the successful inbound transaction. With the features of M.A.P, the messages can also be forwarded to a Third Party Application for further processing. Figure 3 illustrates the inbound service.

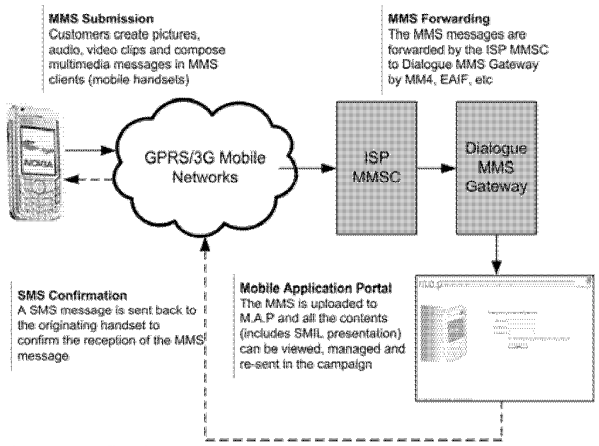

Fig. 3 MMS Inbound Service

4 Conclusion and challenges in 3G networks

This paper presents a new MMS Gateway by discussing its architecture and describing its outstanding features. With the support of multiple protocols, it eliminates the gap of data exchange between the Internet and cellular networks. This MMS Gateway is considered as a scalable, reliable and flexible MMS system which is able to meet the demands of multimedia messaging in 3G.
However, with the emergence of 3G networks, larger message sizes and additional content types are required to be exchanged between users. Besides "person-to-person" message delivery, "person-to-application" and "application-to-person" will bring more attention to both normal subscribers and business people from a variety of industries to share multimedia contents such as high quality photos, cartoon strips, audio and video trailers between wired networks and wireless networks. Further research and development on this MMS Gateway should be scheduled.

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