Multimedia Messaging Service (MMS)

Multimedia Messaging Service (MMS) was first commercially launched in 2002, as the successor to Short Message Service (SMS). It's standardization work was initiated by the 3rd Generation Partnership Project (3GPP) and the WAP Forum in 1999. In Western markets, MMS a great deal of expectation achieves as the key application of General Packet Radio Service (GPRS)/Universal Mobile Telecommunications System (UMTS) (which is also known as Wideband Code Division Multiple Access (W-CDMA)).

This article reviews the service trends and the technologies of MMS, focusing on the standard specification document.

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1. Service Overview

Multimedia Messaging Service (MMS) is a store-and-forward type messaging service capable of handling multimedia data, inheriting the service concept of Short Message Service (SMS), which has spread broadly in the world of Global System for Mobile Communications (GSM).

SMS has proliferated at an explosive pace since its commercial launch in 1992, and is now the most commonly used data service in GSM. The concept of SMS is an easy-to-use service. It is a push-type messaging service, in which a message sent by specifying the address by phone number is automatically delivered to the addressee's mobile station. Its user acceptability has been derived from such user-friendliness. In principle, the message charges are paid by the sender (the sender is charged and the recipient incurs no cost), and it is claimed that about 2 billion short messages are being exchanged per day worldwide.

While SMS is a simple messaging service which carries only 140-octet data, the third-generation (3G) networks have given rise to the need to send text messages in combination with various multimedia data, such as images, audio and video, whilst inheriting the user-friendliness of SMS. In response, the 3rd Generation Partnership Project (3GPP) commenced MMS standardization work in 1999 and released the first specification documents (requirement specification and functional specification) in March 2000. Then, the WAP Forum started drafting a WAP-based implementation specification and released the documents in 2001. In 2002, the first MMS-enabled mobile station was shipped, and MMS was commercially launched.

MMS is one of the network services provided by an operator. In principle, the sender is charged, and a user can send a message by specifying the destination by phone number as in the case of SMS. The service concept of MMS is a "movie postcard": it incorporates functions not only to send photos, but also to give sophisticated presentations that visually appeal to the user, by combining multiple images and text. The exchange of movie postcards is not limited to user-to-user; contracted content providers also distribute attractive contents, effectively using the presentation functions. **Figure 1** shows how MMS is generated and submitted, whereas **Figure 2** shows the flow of MMS retrieval process.

Especially in Western markets, a great deal of expectation is placed on MMS as the key application of General Packet Radio Service (GPRS)/Universal Mobile

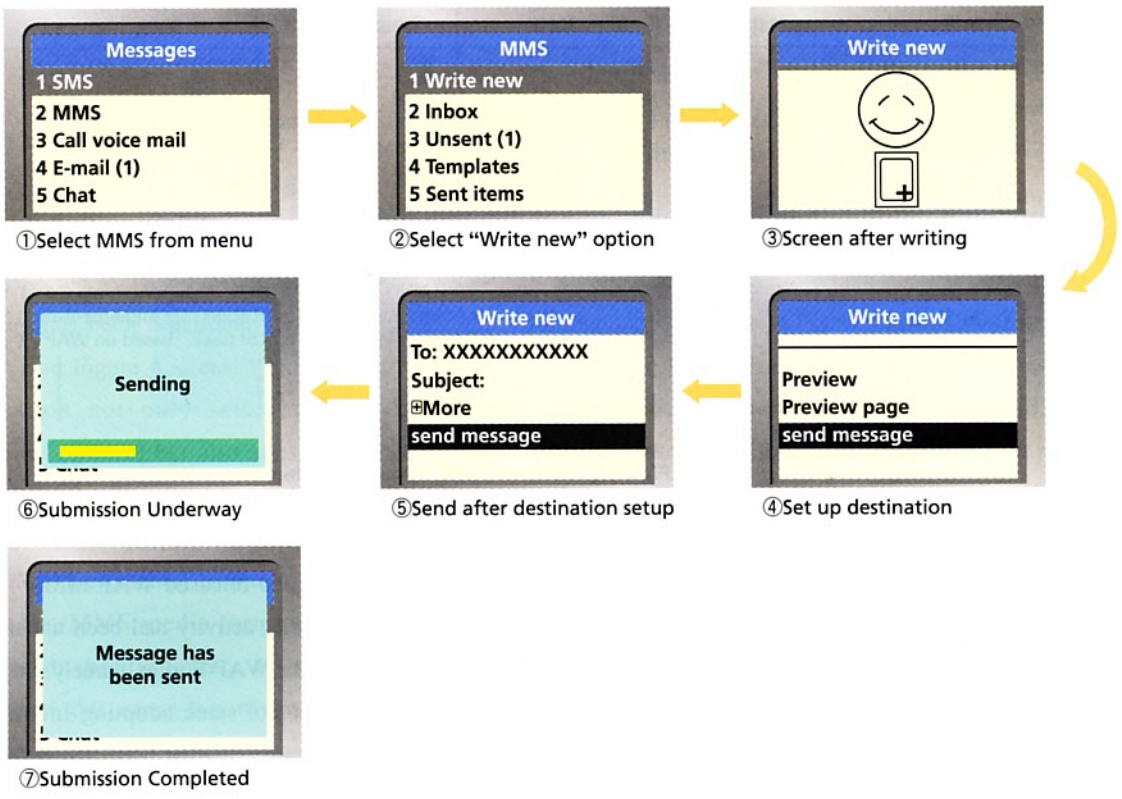


Figure 1 Flow of MMS Generation and Submission Process (Example of T68i)

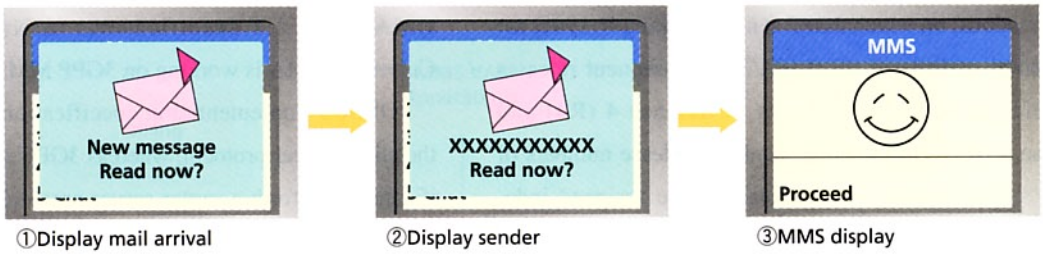


Figure 2 Flow of MMS Retrieval Process (Example of T68i)

Telecommunications System (UMTS) (which is also known as Wideband Code Division Multiple Access (W-CDMA)), to succeed to SMS. However, the interpretation of the specifications is unclear in some aspects, and certain matters are left to implementation, as it has not been given enough time to mature yet since the release of the MMS specifications. As such, issues still remain on service and technology fronts, including the interoperability problems.

2. State of MMS Standardization

The standardization work concerning MMS is shared by 3GPP and the Open Mobile Alliance (OMA). As the WAP Forum merged with other forums and was reorganized into OMA in June 2002, OMA sustains the mission of MMS standardization. In the following sections, the WAP Forum and OMA are collectively referred to as "OMA" unless it is necessary to distinguish them from each other.

As for the work divided between 3GPP and OMA, 3GPP developed the requirement specification TS22.140 [1] (referred to as Stage.1 in 3GPP) and the functional specification TS23.140 [2] (Stage.2), whereas OMA developed the implementation specifications for client-server protocol on WAP protocol stack [3] through [6] (Stage.3). When 3GPP produced the functional specification, a number of implementation methods were considered, and the plan was to work out an implementation at OMA based on the WAP protocol. However, no other

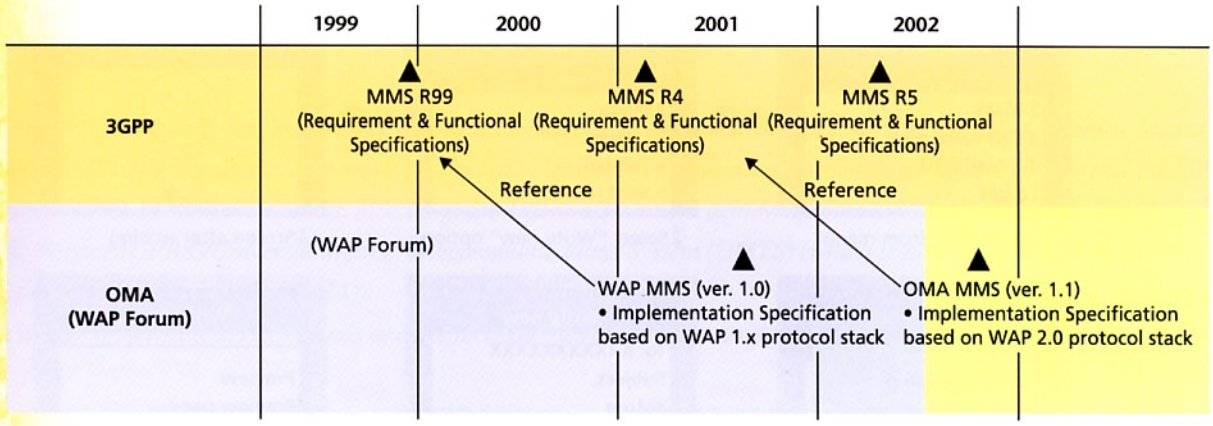


Figure 3 State of MMS Standardization

implementation specification was produced, so the work was divided in such a manner.

3GPP releases specifications on a yearly basis. In the beginning of the year, 3GPP decides the work item, and starts working on the development of specifications. After a year of work, it releases the developed specifications collectively. Once a specification is released, the functions are frozen in principle. If functional additions are to be made, a proposal must be made towards the next release. The first specifications, on which 3GPP started working in 1999, are referred to as Release 99 (R99). The subsequent releases are referred to in numbers, as in Release 4 (R4) and Release 5 (R5). On the other hand, the release numbers of OMA's implementation specifications are assigned independently of 3GPP: 1.0 and 1.1 were released as specifications of the WAP Forum and OMA, respectively. In this article, when the two release lineages are to be specified, the organization name will be attached as in the form of 3GPP MMS R99, WAP MMS 1.0, and OMA MMS 1.1. **Figure 3** shows the releases by 3GPP and OMA.

While 3GPP MMS R99 merely specified the basic architecture and a client-server protocol for MMS, R4 has a full set of basic functions, with the addition of a server-server protocol and functions distinctive to MMS. Further, R5 features more advanced functionality, with the addition of a protocol to connect external providers and to access a network mailbox.

Meanwhile, in response to the work on 3GPP MMS R99, OMA started developing an implementation specification on WAP 1.x protocol stack consisting of Wireless Session Protocol/Wireless Transaction Protocol (WSP/WTP), and released WAP MMS 1.0 in December 2001. As another activity had been under progress at the same time in the WAP Forum, namely, the development of WAP 2.0 protocol stack adopting Internet protocol, the WAP 2.0 release included both WAP 2.0 protocol stack (HTTP/TCP) and MMS on WAP 1.x protocol stack. OMA continued working on MMS to support WAP 2.0 protocol stack and 3GPP MMS R4 functionalities, and released the OMA MMS 1.1 specifications in November 2002. Currently, OMA is working on 3GPP MMS R5 support.

OMA's implementation specifications only set forth the client-server protocol, whereas 3GPP's functional specification sets forth a server-server protocol and an external Value Added Service Providers (VASP) connecting protocol as well. However, no implementation specification has been produced for these protocols, so the functional specification is also serving as the implementation specification.

If one evaluates the standard specifications in view of implementing MMS, some matters are vague and not specified. To tackle this, MMS vendors including Nokia and Ericsson got together and produced the MMS Conformance document [7] for the purpose of clarifying and detailing the specifications. The document primarily sets forth the media format in detail. This cooperative framework among vendors was organized into the MMS IOP Group, and later became affiliated to OMA. In conjunction with this, the MMS Conformance document became an OMA specification, and was published as part of OMA MMS 1.1.

MMS-enabled mobile stations that are currently available in the market are compliant with WAP MMS 1.0, and adopt WSP/WTP as the protocol stack.

3. System Configuration and Elemental Technologies

3.1 MMS Architecture

Figure 4 shows the MMS architecture specified by 3GPP. MMS architecture has been functionally extended with each release in 3GPP, and Figure 4 is based on the latest R5. The MMS specification not only sets forth the message submission/retrieval protocol but also aims to provide all the elemental technologies constituting the complete service. While Figure 4 specifies eight interface points, 3GPP's MMS specifications include MMS elemental technologies in addition to them. Furthermore, MMS media format and charging are defined in the separate specifications.

As matter of fact, this aspect is partly responsible for making it difficult to understand the complete picture of MMS. Although MMS is a network service defined by a specific bearer, it is not easy to understand the MMS system adequately, by browsing the specifications, in regard to what elemental technologies constitute the MMS system, and whether each elemental technology is dependent or independent of the bearer.

Figure 5 shows the configuration of a client-server system based on WAP 1.x. The WAP 1.x protocol is used only between the client and the server, and is independent of other interfaces.

The interfaces specified by the MMS architecture are described in detail below. As for MM2 (MMS Relay-MMS Server interface), the interface point is set forth in the 3GPP functional specification but the two components are treated collectively as MMS Relay/Server and are not distinguished from each other. Therefore, this article will also refer to MMS Relay/Server collectively as MMS server. In regard to MM5 (MMS Server-Home Location Register (HLR) interface), MM6 (MMS Server-User Database interface) and MM8 (MMS Server-Charging System interface), only the interface points are set forth in 3GPP MMS R5 but the details are to be released in the future.

(1) MM1

MM1 is an interface between the MMS client and the MMS server. The 3GPP functional specification sets forth abstract messages that realize forwarding, delivery notification, read-reply report, etc., in addition to the submission, retrieval and

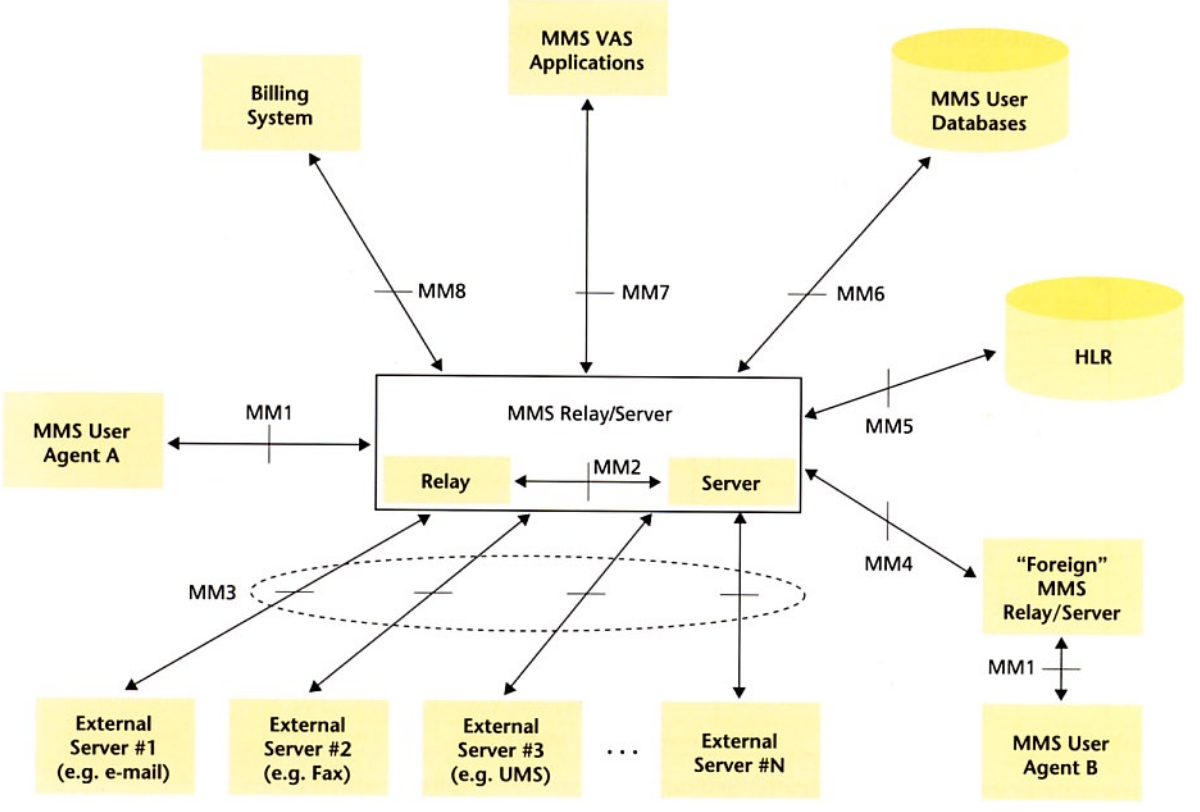


Figure 4 MMS Architecture

notification of MMS messages.

The Protocol Data Unit (PDU) of the message is set forth in the OMA specification [4], [6]. PDU consists of MMS header part and body. The header part includes RFC822 headers and additional X headers that realize functions unique to MMS. The body is structured as MIME multipart [8], and its data type becomes multipart/related when the presentation language Synchronized Multimedia Integration Language (SMIL) is used.

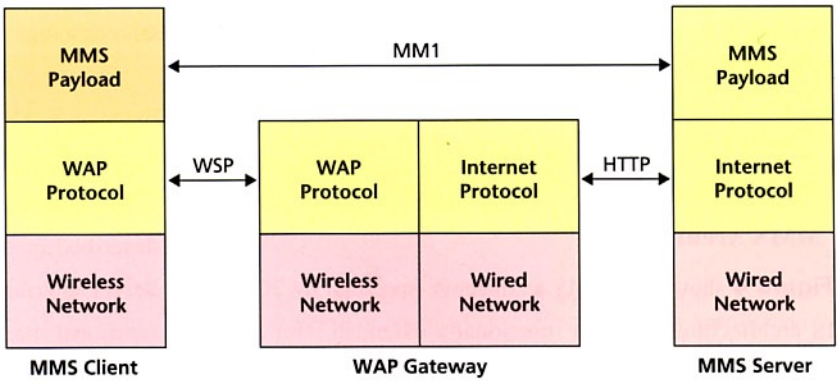


Figure 5 WAP-based System Structure

In WAP 1.x-based implementations, notifications are sent by SMS, and other MMS messages are carried in WSP payload. As message retrieval is performed by indicating the message ID included in the notification, a message cannot be retrieved without receiving the notification. OMA specifications [3], [5] set forth two sequences, one for a case in which the client retrieves the message immediately after receiving a notification, and another for a case in which the message is retrieved based on the user's instruction (**Figure 6**). Generally, the option is set up in the mobile station.

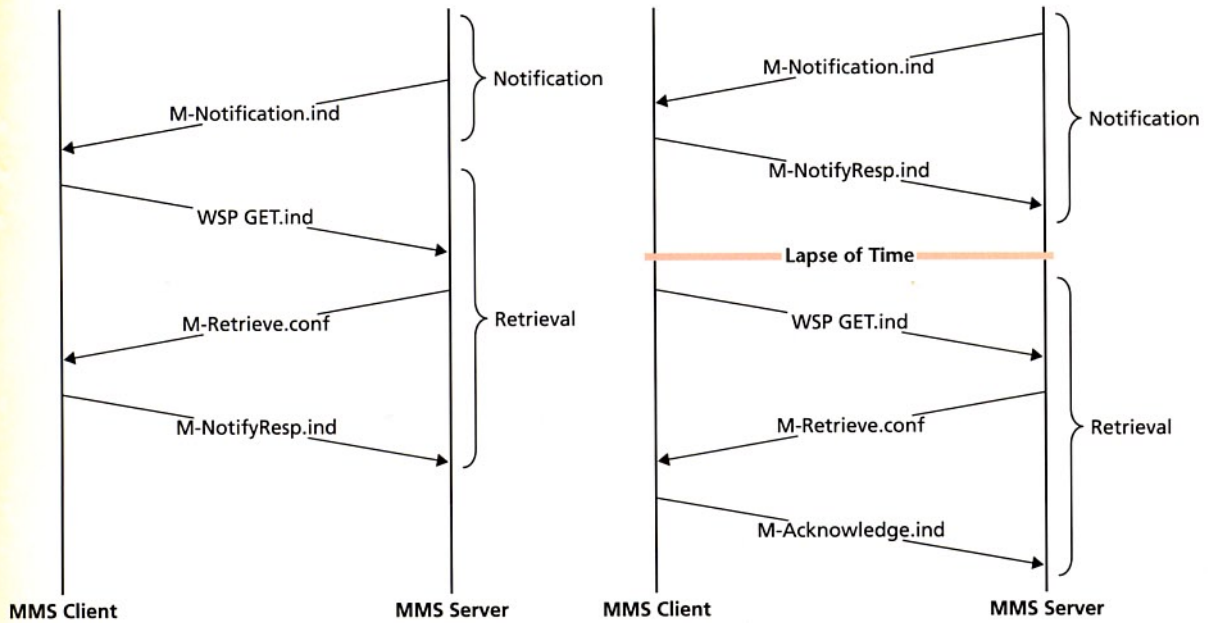
In addition to WAP 1.x-based implementations, the 3GPP functional specification refers to MM1 using Internet mail protocols such as SMTP, POP3, IMAP4 and HTTP for reference information.

(2) MM3

MM3 is an interface that specifies the interworking between the MMS server and an external messaging system. External messaging systems include SMS, FAX and voice mail, as well as e-mail.

In the 3GPP functional specification, the Annex shows a chart featuring SMS, FAX, voice mail and e-mail as reference information, but does not specify the details.

(3) MM4



(1) **If user retrieves message immediately after notification**

(2) **If user retrieves message later**

Figure 6 Message Retrieving Sequence

MM4 is an interface for connecting an MMS server with another MMS server. The 3GPP functional specification determines that the Protocol Data Unit (PDU) of MM4 abstract messages is carried in SMTP payload, and sets forth the correspondence of information elements included in the abstract message between MM1 and MM4.

As no MM4 implementation specification is made by OMA, the MM4 specification in TS23.140 [2] is deemed to serve as the implementation specification as well. However, TS23.140 lacks some detailed descriptions, such as handling MMS transfer error processing, mapping MMS information element to SMTP envelope, etc., meaning that they will depend on the implementation.

(4) MM7

MM7 is an interface between the MMS server and the Value Added Service Provider (VASP). The 3GPP MMS R5 specifies the data format of the abstract messages and the protocol based on Simple Object Access Protocol (SOAP).

3.2 MMS Elemental Technologies

This section summarizes the relevant elemental technologies set forth in the 3GPP functional specification for building an MMS system. While many of them are bearer-independent technologies, some do depend on the bearer; thus, as a whole, MMS is a bearer-dependent service. In this section, (1) through (4) in the following list are bearer-independent technologies, whereas (5) through (7) are either bear-dependent technologies or technologies that may become dependent.

(1) Media Format

The media format adopted by MMS is specified in 3GPP TS26.140 [9]. However, as it defines too many data formats and includes ambiguities, MMS vendors created the MMS Conformance document [7] separately thereto and determined the minimal media format that guarantees interoperability. **Table 1** summarizes the outline set forth in the two specifications.

(2) Presentation

Individual media constituting the MMS message (text, images, voice, etc.) are combined and displayed to the user as a single presentation. In order to realize the concept of this "movie postcard", discussions about the need of a presentation language have taken place since 3GPP R99. 3GPP specifies the 3GPP SMIL Profile [10] for packet streaming services, and adopts it as the MMS presentation language in MMS R5. SMIL is described as part of the media format in 3GPP TS26.140.

3GPP SMIL Profile is a subset of SMIL 2.0 [11], which is a W3C recommendation. It is a superset of SMIL Basic [11],

Table 1 MM Media Format

		3GPP TS 26.140	MMS Conformance Document
Text	Character set	Unicode subset	ISO 8859-1
	Encoding	Unspecified	US-Ascii, UTF8, UTF16
Voice	AMR	M	M
	AMR-WB	M	
Audio	MPEG-4 AAC Low Complexity object type	R	
	MPEG-4 AAC Long Term Prediction object type	O	
Ringtone	Scalable Polyphony MIDI	R	
Still Picture	JPEG (baseline)	M	M
	JPEG (progressive)	O	
Bitmap Graphics	GIF87a	R	M
	GIF89a	R	
	PNG	R	M
	WBMP		M
Vector Graphics	SVG-Tiny	M*1	
	SVG-Basic	O*1	
Video	H.263 Profile 0 Level 10	M*2	
	H.263 Profile 3 Level 10	R*2	
	MPEG-4 Visual Simple Profile Level 0	R*2	
Business Information	vCalender 1.0		M
	vCard 2.1		M

M: Mandatory specification R: Recommended specification O: Optional specification
*1 Mobile station supporting two-dimensional vector graphics
*2 Mobile station with video support

which is specified for mobile purposes. The 3GPP functional specification includes cases in which streaming services are activated from an MMS message, and this is one of the reasons why the 3GPP SMIL Profile was commonly adopted as the presentation language.

However, some elements of 3GPP SMIL Profile would be significant only when they are combined with streaming services, which become problematic as the specification is burdensome for an MMS isolated implementation. To tackle this, the MMS Conformance document [7] specifies a small subset of the 3GPP SMIL Profile, and mobile stations released in the initial stages use it as reference.

(3) Digital Rights Management

In order for VASPs to provide content services, there must be a Digital Rights Management (DRM) mechanism to prevent the unauthorized copying of content distributed by MMS. From 3GPP MMS R5 onwards, an information element of Message Distribution Indicator has been added to indicate VASP's intentions of no fowarding. However, this constitutes reference information indicating the VASP's intentions, and an explanation is given that the client has no responsibility over the Message Distribution Indicator. For this reason, it is hard to say that sufficient copyright management is performed simply by designating a Message Distribution Indicator.

Mobile stations that are currently available in the market support 3GPP MMS R99, meaning that they either do not support DRM or adopt a proprietary system. This is regarded as a major problem in launching MMS services, and the work items were approved by both 3GPP and OMA respectively.

(4) Content Conversion

As the terminal capabilities, such as the supported media type and the screen size, vary depending on the mobile station, there is no guarantee that all the media contained in the message retrieved by a mobile station will be available as intended by the sender.

The 3GPP functional specification presumes two ways to convert content to solve this problem. The first way is to convert the media type, which involves, for example, the conversion of an SMS message into a text message. The second way is to convert the media format: an example is the conversion of JPEG content into GIF format.

Conversion may be performed both on the terminal side or the network side, i.e. the mobile station may convert the content received, or the network may convert the content into the appropriate format or size prior to sending it to the mobile station. As the 3GPP functional specification does not set forth the details of content conversion, the conversion method is left to the implementation.

(5) Device Management

Two types of device management are required for MMS proliferation. The first is to distinguish whether the recipient mobile station supports MMS. This is because even if the user is subscribed to MMS, he/she might be using a mobile station that does not support MMS by swapping the SIM/USIM card. The second is the management of the MMS-enabled mobile station's capabilities, such as the media type and the data size that it supports.

The former is outside the scope of the 3GPP functional specification. It is a commonly used method that the user registers the type of his/her mobile station in the user database, and the MMS server can refer to the user database to distinguish whether it is a MMS-enabled mobile station or not.

As for the latter, a method to notify the mobile station's capabilities to the MMS server by using the User Agent Profile (UAProfile) [12] is specified. However, the problem is that not all mobile stations implement UAProf. In this case, if the type of media supported and the screen size vary among the mobile stations, there is no way to notify the difference to the MMS server.

(6) Address Resolution

The 3GPP functional specification sets forth two addressee types for the user to specify the destination; the phone number (MSISDN) and the e-mail address. The server must support these two types of addresses. Further, 3GPP MMS R5 adds the short code address to specify VASP as an option.

Routing of messages between MMS servers is done by the IP address. If the destination address is specified by MSISDN, address resolution is required in order to acquire the IP address of the destination MMS server from the MSISDN address of the destination terminal. The 3GPP functional specification sets forth two address resolution methods: (1) Use the Domain Name System-Electronic

NUMbering (DNS-ENUM) protocol [13]; and (2) Use the International Mobile Subscriber Identity (IMSI).

Electronic NUMbering (ENUM) is available only in limited areas for commercial services, as its administration has just begun in some countries. In cases where address resolution based on IMSI is sought, it is necessary to add MMS Environment (MMSE) domain name management to IMSI table. Its operation is expected to become a future issue.

(7) Charging

As MMS is a network service, it is necessary to issue a Charging Data Record (CDR) when an MMS message is submitted or retrieved, in order to settle the charges between operators. The MMS CDR format is specified in 3GPP TS32.235 [14].

Generally, the charging principle of SMS is per message basis, and message charge is paid by the sender and no charge is incurred by the recipient. Although the charging rule is outside the scope of the MMS specification, MMS inherits the principle from SMS, and the charge is generally paid by the sender.

Although the message size of SMS is fixed at 140 octets, the MMS message size varies significantly depending on the existence of attachments and the type of media. Therefore, operators should determine charging rules such as the correlation between message size and charges, and the message submission/retrieval during roaming.

4. Comparison between MMS and E-mail

This section describes the characteristics of MMS based on comparison with e-mail, which is broadly used over the Internet. One of the main differences is that e-mail is an application over the IP layer, whereas MMS is deemed to be a network service like telephony.

As the operator provides MMS as a network service, end-to-end service quality must be guaranteed. For this reason, the MMS specification was required to specify all elemental technologies neccessary to provide the service. In MMS, in addition to message exchange between mobile users, VASPs contracting with the operator provide content services. Interworking with e-mail may be supported as an optional service to MMS at the individual operator's discretion. **Table 2** is a summary of MMS in contrast with e-mail.

Table 3 shows the services distinctive to MMS. These services are analogous to telephony services. However, the services are optional except the notification, and are provided at the operator's discretion.

Many of the services referred to in Table 3 have been added in R4 and later releases, after the basic architecture was specified in 3GPP MMS R99. Therefore, Reply-Charging associated with charging is limited to the same operator by the architectural limitation, i.e. there is no specification for the service across operators.

5. State of Service Proliferation

5.1 MMS Service

MMS was first commercially launched by Telenor in Norway, in March 2002. Since then, MMS has been commercially launched not only in Europe but also in North America and Asia. This section describes the extent to which the service is spreading in Europe. In Europe, MMS was provided by 64 operators in 27 nations as of February 2003. More operators are expected to launch MMS services in the future.

The usage of MMS includes not only person-to-person message services, but also sending text, image and music to one or more users, but also push-type information distribution services, in which the user regularly receive content from registered VASPs such as weather forecasts, news, and the greeting cards submission and retrieval.

For the submission and retrieval of MMS, GPRS—which is the packet network of GSM—is normally used.

Although the charging rule depends on the operator providing the service, the sender is charged in principle, as in the case of SMS. The sender is charged 0.15-1.00 Euro (\20-\120) per message. **Table 4** lists the services available in Europe.

5.2 MMS-enabled Terminals

Table 5 shows the specifications and other information of MMS-enabled terminals currently being sold. The user must set up the terminal personally to use MMS, unlike i-mode. There are a number of ways to set up the terminal: set up the terminal manually based on the procedures given by the operator when purchasing the terminal; set up the terminal manually based on the information obtained from the terminal vendor's website; or set up the terminal by storing the parameters recieved from the operator or the terminal vendor at SMS.

Many terminals available in the market are equipped with a

Table 2 Comparison of MMS and E-mail

	MMS	e-mail
Basic Idea	Network service defined by 3GPP. An operator provides advanced services exclusively within its network.	Application over IP. Secures interoperability with Internet mail and creates added value to mobile.
User Service		
Push	A pseudo-push-type mail service: The user retrieves the message after receiving a message notification.	Pull-type mail service: Client actively picks up the message. Push-type mail is possible based on combination with OMA message notification specification, but there are no implementation cases as of yet.
Selecting Incoming Message	Able to select a message.	Able to select an element in a message such as text, image etc.
Address	MSISDN/e-mail address	E-mail address
Presentation	MMS SMIL	Unspecified
Media Format	As set forth in 3GPP/OMA specification	Unspecified
Interworking with Internet Mail	In principle, available among mobile users. Interworking with Internet mail is yet to be decided.	User can exchange e-mail with any Internet user by subscribing to one ISP.
Additional Services	Additional service similar to phone/SMS. Example: Reply charging	Basically the range of services that can be realized by e-mail.
Charging	In principle, charged per message.	Packet charging
Architecture		
Network Configuration	Specification supports routing over both Internet and GRX. At the operator's discretion.	Each ISP connects to the Internet.
Interworking across Operators	Need to conclude MMS interworking contract and produce CDR.	No need for interworking contract or settlement of charges between operators.
Roaming	Fulfilled by packet roaming,	Fulfilled by packet roaming.
Interworking across Mail Servers	Proprietary protocol (MM4), negotiation required.	SMTP
VASP Connection	Proprietary protocol (MM7)	SMTP
Reliability	High (Guaranteed by operator as a network service)	Equivalent to Internet

Table 3 Functions distinctive to MMS

Service Name	Service Outline	Specify in:
Message Notification	Notifies the MMS Client of the arrival of message.	R99
Delivery Report	Reports to the sender that the message has been retrieved by the MMS client.	R4
Read-Reply Report	Reports to the sender that the message has been read by the MMS client.	R4
Address Hiding	Does not display the sender's address according to the sender's request.	R4
Reply Charging	The charge for reply message is borne by the sender. A multimedia reply-paid postcard.	R4
Message Expiry	Specifies how long the message can be stored in the MMS server.	R4
Forwarding without Download	Forwards the message on the MMS server to the client without downloading it.	R4
Persistent Network Storage	A mailbox in the network.	R5

color display, and many of them have a camera, either a built-in type or an external component. As for mail functions, some terminals are able to send a mail to more than one destination, and even have the function to directly edit SMIL on the terminal to give presentations, which is distinctive to MMS.

5.3 Interworking with E-mail and Cross-operator

As one of the distinctive functions of MMS, interworking with Internet mail is stated in the reference information in the specification. However, there are hardly any operators that actually provide such a service, and many operators are in the service-preparation stage at present.

Further, MMS interworking across operators is speci-

Table 4 Services available in Europe and List of Charges

Country Name	Operator	Service Launch Date	Service/Charges (Euro/message)				
			～10Kb	10～30Kb	30～100Kb	Info MMS *1	Card *2
Germany	D2 Vodafone	2002/4/18	—	0.39	0.99	0.59	1.99
	T-Mobile	2002/6/1	—	0.39	0.99	—	1.99
	O2	2002/11/8	—	0.39	0.99	—	2.99 *3
UK	T-Mobile	2002/6/3	—	0.55	—	—	—
	Orange	2002/8/13	—	0.62	—	—	—
	Vodafone	2002/10/25	—	0.56	—	—	—
	O2	2002/11/4	—	0.62	—	0.24	—
Spain	Amena	2002/6/1	—	0.15	—	0.15	—
	Telefonica	2002/9/2	—	0.60	—	—	—
	Vodafone	2002/10/25	0.20	0.60	1.00	—	—
France	Bouygues Telecom	2002/9/16	—	0.30	—	—	—
	SFR	2002/9/17	—	0.45	—	—	—
	Orange *4	2002/10/17	—	—	—	—	—

* 1 Service that enables user to regularly retrieve pre-registered content
* 2 Greeting card submission/retrieval service
* 3 Charges applied when message features animation
* 4 Free service until Dec. 31, 2002

Table 5 Specficiations of MMS-enabled Mobile Stations

Category	Operator					
Vendor	Sony-Ericsson	Nokia		Sharp		Panasonic
Model	T68i	7650	7210	GX10	GX1	GD87
Image						
Main Functions						
Display	Color	Color	Color	Color	Color	Color
Camera	External	Built-in	None	Built-in	Built-in	Built-in
Multi-Destination	To/Cc/Bcc	To only	None	To/Cc	To/Cc	To/Cc/Bcc
Presentation Production	Yes	None	None	Yes	Yes	Yes
LCD	101×80 256 colors	176×208 4096 colors	128×128 4096 colors	120×160 65536 colors	120×160 65536 colors	132×176 65536 colors

fied in the same way as SMS. However, interworking has not been achieved in practice at the commercial level, due to differences in implementation of infrastructure and terminals. Currently, standardization bodies such as OMA and operators are actively examining implementation concerning interoperability, so the number of operators which are able to achieve MMS-interworking is expected to increase gradually in the future.

6. Future Issues and Analysis

Although there are not many types of MMS-enabled terminals currently available in the market now, more MMS-enabled terminals are expected to be released in the future, as MMS is likely to become the key application in GPRS/UMTS (W-CDMA). Operators introducing MMS are also likely to increase further in the future.

Western operators have great expectations for MMS, But on the other hand, MMS has many technical issues that are common in services at the initial stage, Since MMS has launched fairly recently. The biggest issue is poor interoperability. Major issues are not limited to interoperability at the protocol level, such as the server-client and server-server protocols mentioned in sections 3 and 4; but they also include the difference in the media format supported by mobile stations and the difference in screen size which are directly experienced by users.

Another issue, which also relates to interoperability, is the establishment of operation rules. As charging, roaming, address resolution, etc. cannot be determined only by the standard specification, it is necessary to establish operation rules between operators.

The issue of ensuring interoperability is expected to be solved gradually, as OMA is aiming to guarantee end-to-end service, and interoperability tests are being conducted across vendors. Moreover, operators are working on the formulation of operation rules.

MMS is currently making progress led by expectations. Its directions are expected to become clear within the next year or so as to whether it will be accepted as a key service by solving interoperability and operational rules issues or remain as a limited service by taking toolong for solution. Much attention needs to be paid on MMS proliferation in the days to come.

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