MMS—Building on the success of SMS

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With an estimated 15 billion SMS messages being sent throughout the world every month, SMS, or text messaging, has proved extremely popular among GSM subscribers. Users appreciate the simple, convenient and personal communications medium that mobile terminal-to-mobile terminal messaging provides. Now, with the addition of features like color pictures, animations, audio samples, and video clips, MMS promises a dramatic increase in messaging capabilities that will enrich user experience and create a major new source of revenue for network operators as well as content and service providers.

Short message service (SMS) is a fairly basic service that enables GSM subscribers to send simple text messages of up to 160 characters to one another. But the creativity that SMS users have shown in devising their own abbreviated *tXt* language, emoticons and individual touches indicates their enthusiasm for what is a highly personal and effective communications medium, and their eagerness to experiment with mobile communications technology.

Multimedia messaging service (MMS) will allow users to express themselves more fully, making mobile messaging more creative and entertaining.

The enhanced messaging service (EMS) that is now becoming available with sound, pictures and animations only hints at what we can come to expect from MMS. With MMS it will be possible to send and receive rich, integrated content made up of video, digital audio, color images and animations. MMS is more than just messaging: it is a service environment that facilitates the creation of a new wave of interactive applications and services, such as maps, postcards, screensavers and business cards.

The push capabilities of MMS will also open up a new communication channel through which companies can send promotions and other information that customers request.

A natural evolution of SMS

In concept, MMS is similar to SMS. And in terms of user acceptance, this is important. However, there is a world of difference in the content capabilities of the two services. SMS is a store-and-forward service, which means that messages are not sent directly between users but rather via an SMS center. This enables instant delivery, nominal tariffing, simultaneous SMS and voice capability, international roaming without international fees, and message delivery that does not hinder, and is not hindered by, network traffic. Besides direct communication, SMS is used to alert users of incoming e-mail, voice mail and faxes, as well as to call their attention to weather forecasts, news headlines, stock quotes, lottery results and other events.

The recently introduced EMS standard can be viewed as an intermediary stage between SMS and MMS. EMS offers a combination of text and simple pixel-images and melodies. Like SMS and EMS, MMS enables messages to be composed easily and immediately between mobile devices (via the mobile network) without the need for Internet e-mail addresses or mailboxes.

As with SMS, MMS does not require a network mailbox, so users do not have to log on to receive messages. Each message is automatically pushed to the user's MMS-enabled mobile device. Likewise, if the recipient's mobile device is switched off or temporarily out of coverage, the message is stored by the network until it can be safely delivered. Users can send, receive, reply to, delete and forward messages.

Unlike SMS, however, virtually no limits are put on the size or the sophistication of MMS message content. What is more, MMS messages can be exchanged between MMS-enabled mobile devices and Internet e-mail accounts.

MMS overcomes the character limit of SMS. It also allows formatted text, photos, drawings, graphics, animations, PowerPoint-style presentations, audio samples, and video clips to be woven into the mes-

BOX A, TERMS AND ABBREVIATIONS

3GPP	Third-generation Partnership Project
AMR	Adaptive multirate
CDR	Call detail record
EDGE	Enhanced data rates for global evolution
EFR	Enhanced full-rate
EMS	Enhanced messaging service
GIF	Graphic interchange format
GPRS	General packet radio service
GSM	Global system for mobile communication
H.263	ITU standard for video compression (coding) for video-conferencing and video-telephony applications
HiFi	High fidelity
HTTP	Hypertext transfer protocol
IP	Internet protocol
ITU-T	International Telecommunication Union – Telecommunications Standardization Sector
JPEG	Joint Photographic Experts Group
MIDI	Musical instrument digital interface
MMS	Multimedia messaging service
MMS-C	MMS center
MMSE	MMS environment
MP3	MPEG layer-3
MPEG	Moving Picture Experts Group
MSISDN	Mobile station ISDN number
PDU	Protocol data unit
SMIL	Synchronized multimedia integration language
SMS	Short message service
WAP	Wireless application protocol
WAV	Windows audio volume
WBMP	Wireless bitmap
WCDMA	Wideband code-division multiple access
WSP	Wireless session protocol
XML	Extensible markup language

sage. For example, a message can include a photograph or video clip taken by a built-in digital camera. Or photographs and other content can be transferred from cameras and other devices to the mobile device over a wireless Bluetooth connection. Images and sound can also be downloaded from a website or recorded by the person sending the message.

For users, MMS enhances personal connectivity and productivity through a more immediate exchange of rich content—for instance, while on the road, users can receive a localized city map; or while at a conference, an up-to-the-minute graph or layout. MMS can also serve as a virtual e-mail client, giving users efficient and immediate access to content-rich messaging outside the home or workplace.

For network operators, MMS promises additional revenue as a result of increased air time, heavier all-around usage, service differentiation, and customer loyalty. Market studies show that users are not only enthusiastic about MMS, they are also willing to pay as much as five times more for the service than they currently pay for SMS. By deploying MMS today, operators can secure a strong market position early in the personal multimedia era.

New opportunities for content and service providers will grow from the sheer diversity of new services and demand for new content.

MMS content

The basic principles of SMS and MMS are similar, but the difference in content is dramatic. The size of an average SMS message is about 140 bytes, whereas in its early stages, the average size of an MMS message is likely to be around 30,000 bytes; later on, about 100,000 bytes.

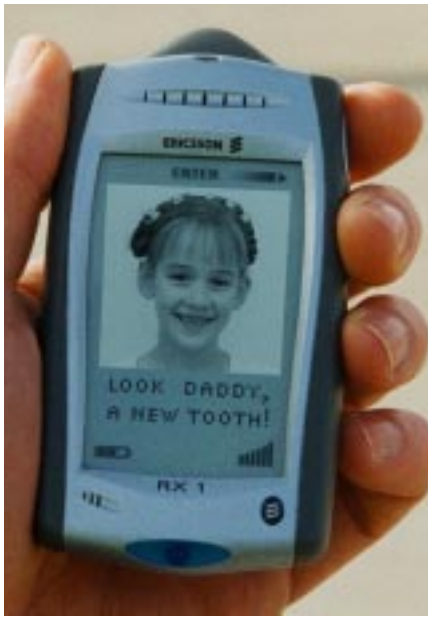
The message elements available to users as part of MMS are dependent on the data capabilities of the wireless network and on the capabilities of the device. As mobile networks develop (third-generation), and new mobile devices are introduced, the range of messaging options will grow.

The following message options are currently covered by the MMS standard. More will be added as the standard develops:

- Text—as with SMS and EMS, an MMS message can consist of plain text. EMS and MMS also enable text to be formatted using different fonts, sizes, and styles. The main difference between formatted text in EMS and MMS is that MMS allows much greater amounts of text than SMS/EMS. In EMS, formatted text can be accompanied by simple pixel images or melodies. In MMS, the formatted text can be accompanied by photographic images, graphics, audio samples, and video sequences.
- Graphics—graphs, tables, charts, diagrams, maps, sketches, plans and layouts are just a few examples of the kind of graphics that MMS can handle. As location-based services become more prevalent, maps and sketches will have ever greater relevance to mobile users.
- Audio samples—MMS supports the addition of audio samples to messages. For example, users can exchange a favorite song, or they can use the mobile phone to record and send sound samples, including voice. Instead of sending, say, a simple downloaded birthday jingle, a user might send a sample of her own personal rendition of "Happy Birthday." MMS can also be used to send MP3 files or other high-quality audio formats.
- Images—one of the most exciting attributes of MMS is the ability to send images. MMS allows users to share meaningful moments with friends and family, or to exchange useful visual information with colleagues. Using a mobile device with either a built-in or attached digital camera, users can take a snapshot, add some text, and send it as a digital postcard. Business users could record and send pictures of a

Figure 1
Example of creative SMS.

Figure 2
MMS enhances personal connectivity and productivity through a more immediate exchange of rich content.



construction project, or capture and store a new design concept for later review.

- Synchronized presentations—using the synchronized multimedia integration language (SMIL, an XML-based protocol), MMS enables PowerPoint-style presentations (with integral audio and video) to be created on, and sent from/received by mobile devices. Using a simple media editor, users can incorporate audio and video along with still images and formatted text in multimedia presentations.
- Video—the ultimate extension of the MMS digital imaging capabilities will be video content. Users will be able to record a scene using a built-in digital camera and transmit the clip to a recipient (initially, they will be able to exchange 30-second video clips).
- Streaming media—large video and sound content can be streamed using MMS without having to occupy memory in the phone. Although this seems like a contradiction—since the basic principle of MMS is to store messages locally in the phone—streaming technology is actually well suited for MMS. When the message is viewed in the phone, the content is not stored, but is streamed directly to it. However, certain objects in the message, such as the text, can be stored in the phone. Multiple content types can exist in the same message.

A new standard for tomorrow, ready for today

Three main specifications have been defined for MMS:

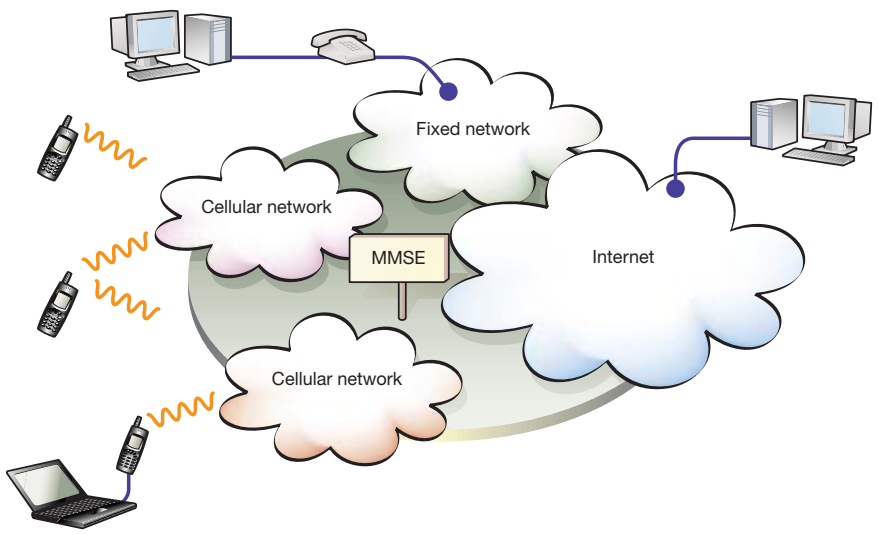
- 3G TS 23.140 Multimedia Messaging Service—defined by the Third-generation Partnership Project (3GPP), this specification defines the overall MMS service, excluding the WAP-related areas (to which it refers);
- WAP MMS Architecture Overview—this specification defines the application-level activities that realize the MMS service; and
- WAP MMS Message Encapsulation—this specification defines the MMS message structure and encodings.

The MMS global standard currently being finalized by the 3GPP has been developed to take maximum advantage of the high-speed data capabilities of third-generation wireless networks. However, the first wave of MMS services can be launched in second-generation networks. The range of content options will be expanded as the capabilities of core and radio access networks are enhanced to enable video clips and synchronized multimedia presentations.

At the request of the 3GPP, MMS has also been included as part of the wireless application protocol (WAP); the MMS specifications for WAP have been developed by the WAP Forum. WAP provides significant support for MMS, in the direct service specification as well as in the underlying technologies.

By using WAP as its bearer technology and through standardization in 3GPP, MMS has wide industry support and offers full interoperability, which is a major benefit to operators, service providers, and consumers. With WAP as the air-interface protocol, MMS can take advantage of high-speed mobile technologies such as general packet radio service (GPRS), enhanced data rates for global evolution (EDGE) and wideband code-division multiple access (WCDMA); it also supports a variety of image, video, and audio formats. This means that MMS will ultimately serve as the default mode of messaging on all mobile devices, and help make the exchange of rich content as straightforward as SMS is today.

Figure 3
The multimedia messaging service architecture.



MMS will support industry-standard media formats, including

- image (JPEG and GIF 89a, WBMP);
- video (ITU-T H.263, MPEG 4 simple profile); and
- audio (MP3, MIDI, WAV, AMR/EFR—for voice).

MMS architecture and elements

Figure 3 shows a general view of the MMS architecture, which combines different networks and network types, and integrates already existing messaging systems in these networks. The MMS environment (MMSE) encompasses all necessary service elements for delivery, storage and notification. These can be located within one network or distributed across several networks or network types. The MMSE can comprise

- second- and third-generation networks;
- second-generation networks with islands of third-generation coverage; and
- roamed networks.

Connectivity between different network types is provided by the Internet protocol (IP) and its associated set of messaging protocols.

The MMS server is responsible for storing and handling incoming and outgoing messages. Associated with the MMS server is the MMS proxy relay, which is responsible for transferring messages between different messaging systems. The MMS server and MMS proxy relay can be

- separate;
- combined—as in the Ericsson MMS center (MMS-C); or
- distributed across different domains.

The MMS proxy relay can generate charging data (call detail record, CDR) when it receives multimedia messages or delivers them to an MMS user agent (client) or to another MMS environment. The MMS proxy relay is also responsible for converting messages—that is, it adapts messages to the capabilities of the receiving device.

A new and important capability of the MMS-C is that it can identify the capabilities of the receiving MMS terminal. The MMS-C converts the MMS message for the receiving terminal and maintains backward compatibility. For instance, if a new MMS terminal sends a high-resolution color image to an older MMS terminal that only supports black and white, low-resolution images, the MMS-C will convert the picture to black-and-white. This function applies to all content, such as video clips, still images, and MP3 files. These features—media conversion and terminal capability negotiation—are new in MMS and were missing in SMS. The interoperability problems we have today in SMS are thus resolved by MMS.

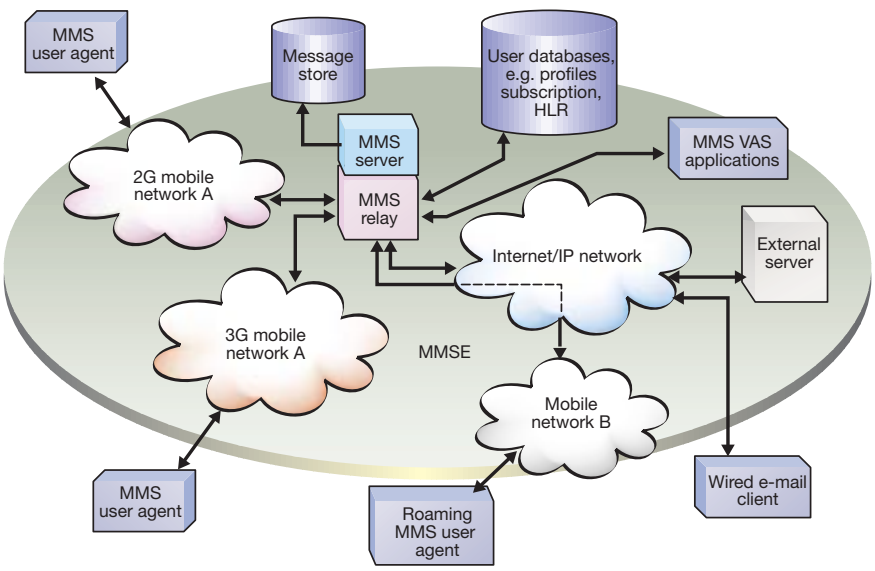


Figure 4
Representation of the multimedia messaging service (MMS) network.

The MMS user database can comprise one or more entities that contain user-related information, such as subscription and configuration (for example, user profile or home location register).

The MMS user agent is an application layer function that resides on a mobile device, or other external device and enables users to view, compose and handle (send, receive, delete, and so on) multimedia messages.

As shown in Figure 4, MMS uses WAP as the bearer technology for mobile connectivity. The MMS network is built on top of the WAP architecture, in which the WAP gateway provides access to standard WAP facilities such as hypertext transfer protocol (HTTP) methods, push services, over-the-air security, and capability negotiations.

The payload, which includes the multimedia message, is transferred by the WAP session protocol (WSP) and HTTP. It includes several standardized fields, as described in the MMS Message Encapsulation specification. The following MMS services have been defined and standardized:

TABLE 1, WAP PDU FIELDS IN MMS NOTIFICATION ABSTRACT MESSAGE

Name	Content	Comments
X-Mms-Message-Type	Message-type-value = m-notification-ind	Mandatory. Specifies the transaction type.
X-Mms-Transaction-ID	Transaction-id-value	Mandatory. Identifies the notification and the subsequent transaction that is closed by the following M-NotifyResp.
X-Mms-MMS-Version	MMS-version-value	Mandatory. The MMS version number. According to this specification, the version is 1.0.
From	From-value	Optional. Address of the sender. If the sender address can be hidden from the recipient, the MMS Proxy-Relay will not add this field to a message header.
Subject	Subject-value	Optional. Subject of the message.
X-Mms-Message-Class	Message-class-value	Mandatory. Class of the message.
X-Mms-Message-Size	Message-size-value	Mandatory. Full size of message in octets.
X-Mms-Expiry	Expiry-value	Mandatory. Length of time the message will be available. The field has only one format, interval.
X-Mms-Content-Location	Content-location-value	Mandatory. This field defines the location of the message.

- multimedia message transmission—to one or more destinations;
- multimedia message reception in the recipient MMSE—upon reception, the recipient MMSE
  - verifies the recipient user profile;
  - stores the multimedia message (until the message is delivered, forwarded, rejected or expires); and
  - generates notification to the recipient MMS user agent;
- multimedia message retrieval—the recipient MMS user agent can request delivery of a message from the recipient MMSE, based on the information received in the notification report;
- delivery report—this report can be requested by the originating MMS user agent;
- read-reply report—this report can be requested by the originating MMS user agent; and
- support for streaming data—for downloading multimedia message content.

Each of these services is realized by means of various abstract messages, using the standardized fields of the MMS Message Encapsulation specification. Table 1 shows the WAP protocol data unit (PDU) fields for an MMS notification (M-Notification.ind) abstract message. The transactional message flow (Figure 5) is as follows:

1. A message is sent to the server using the WAP post method over a connection-oriented WAP session.
2. Notification is sent to the recipient client using WAP *push* (non-confirmed push).
3. The message is retrieved from the server

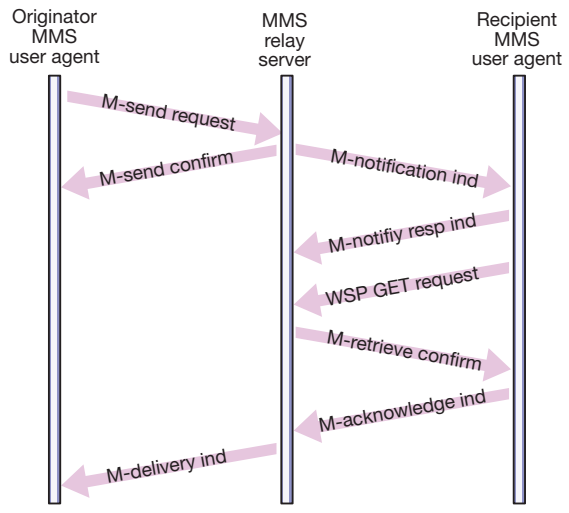


Figure 5
Example MMS transactional message flow in WAP.

Figure 6
The Ericsson T20e mobile phone.

using the WAP *get* method, invoked over a connection-oriented WAP session.
4. A delivery report (terminal-to-server) is sent using a connection-oriented WAP wireless session protocol (WSP) session.
5. A delivery report (server-to-terminal) is sent using connectionless push.

Charging

Given the large investments that operators have made and will yet make in GPRS and third-generation networks, it stands to reason that operators are looking for applications which utilize the new infrastructure. MMS is one such candidate. Indeed, it is expected to be the main GPRS application. MMS should earn operators return on their investments and even generate good profit from their GPRS networks. To do so, however, the charging scheme for MMS must be right. At present, MMS charging has not been specified. It is currently up to the individual operators to decide how they will charge for MMS. Notwithstanding, the MMS Marketing Group, which consists of CMG, Comverse, Ericsson, Logica, Motorola, Nokia and Siemens, has made the following recommendations:

- The charging scheme for MMS should be the same as for SMS.
- The charge for an MMS message should not exceed EUR 0.50.

Ericsson and MMS

MMS requires the introduction of new network infrastructure and new MMS-

BOX B, MMS AT A GLANCE

Multimedia messaging service (MMS) is a new global messaging standard that enables a range of different media elements (including text, pictures, audio, and video) to be combined and synchronized in messages sent between mobile devices. The standard is still evolving, and new functions and features will continue to be added.

MMS is designed to exploit the potential of third-generation wireless networks with high bandwidth. It can also be used over existing second-generation and GPRS networks.

MMS is an "instant delivery" messaging concept, that uses store-and-forward technology rather than requiring an intermediate Internet-style mailbox. However, MMS messages can be sent to conventional e-mail accounts. And MMS messages can be sent from an Internet mailbox to a mobile phone.

The MMS-C hosts the message-conversion function that adapts messages to the capabilities of the receiving terminal. This function facilitates future interoperability.

Users require an MMS-enabled mobile device. WAP is the bearer protocol for MMS.

Ericsson has announced the first MMS-enabled mobile phone, the T68 GPRS phone, and the multimedia messaging service center (MMS-C). These products will be available early in the fourth quarter of 2001.

Figure 7
The Ericsson T29 mobile phone.

compliant devices. Ericsson offers a migration path, via EMS, to the new technology. This approach gives operators, application and service developers, and users an easy-to-use, future-oriented mobile messaging service that they can work with today.

Ericsson has already introduced the world's first EMS-enabled phones (the T20e and T29), and has announced the EMS- and MMS-enabled T68 GPRS phone, which will be available at the end of 2001. Ericsson also gave the world's first live demonstration of MMS at CeBIT 2001.

Ericsson has also announced the MMS-C, which has been specifically designed to enable operators

- to roll out MMS services in existing second-generation and GPRS wireless networks; and
- to expand the range of messaging options in a seamless progression as the mobile network evolves (WCDMA).

The Ericsson MMS-C combines three main MMS functions:

- the MMS server provides a multimedia processing engine and the multimedia service applications.
- the MMS proxy relay, which is the front-end of the MMS-C, provides interfaces to various IP network connections and protocols.
- the MMS store is where all messages are temporarily stored before they are forwarded to the intended recipient.

The MMS-C is the central element of the MMS network architecture. It manages the flow of multimedia messages to and from MMS-enabled mobile devices, and between these mobile terminals and Internet sources and destinations. The MMS-C provides storage and operational support, enables instant delivery of multimedia messages, and supports flexible addressing.

The MMS-C is also able to convert (or adapt) messages—for example, from MMS to SMS—so that processing power and air time are not wasted in sending messages to mobile terminals that cannot receive them.

Figure 8
The Ericsson T68 GPRS mobile phone.

The MMS-C also handles service aspects, such as store-and-forward, guaranteed delivery, subscriber preferences, operator constraints, and billing information.

The MMS proxy relay interacts with the application being run on the MMS-enabled device to provide various messaging services. WAP serves as the bearer between the MMS-C and the MMS client (application). The WAP gateway is used for delivering and retrieving messages.

The MMS server, through which MMS messages are sent, supports flexible addressing—to ordinary phone numbers (MSISDN) and e-mail accounts—which makes the user interface more friendly and provides greater control for network operators.

The MMS-C features a modular structure that enables operators to start small, with a low initial investment, and then undertake incremental upgrades of hardware and software to meet changing needs for capacity and redundancy.

All hardware components are industry-standard, off-the-shelf products. This helps ensure that operators can match hardware to exact needs, taking advantage of changing price/performance ratios, and scale up the multimedia messaging service in line with market demand.

Conclusion

The new MMS standard enhances the SMS mobile messaging experience beyond all recognition, allowing users to add color images, animations, audio samples, and video clips to their personal and business messages. This opens up a significant source of revenue for network operators and content and service providers.

Ericsson has already announced an MMS-capable mobile phone, and has developed an MMS solution that enables operators as well as service providers to smoothly evolve their current SMS business toward mobile multimedia.