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Multimedia Messaging Service (MMS);
Functional description;
Stage 2
(Release 6)





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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document defines the stage 2 and stage 3 description of the non-realtime Multimedia Messaging Service, MMS. Stage 2 identifies the functional capabilities and information flows needed to support the service described in stage 1.

The present document includes information applicable to network operators, service providers and terminal, switch and database manufacturers.

The present document contains the core functions for a non realtime Multimedia Messaging Service, MMS, which are sufficient to provide a basic service.

MMS uses a number of technologies to realise the requirements of the stage 1 description (3G TS 22.140) [1]. The present document describes how the service requirements are realised with the selected technologies. As far as possible existing protocols (e.g. WAP, SMTP, ESMTP as transfer protocols; lower layers to provide push, pull, notification) and existing message formats (e.g. SMIL, MIME) shall be used for the realisation of the Multimedia Messaging Service.

The present document serves as a foundation for the development of MMS. It describes a new service which has no direct equivalent in the previous ETSI/GSM world or in the fixed network world. In consequence readers may find that certain aspects are not clearly defined or open to misinterpretation. Where any such case is encountered it is essential that the issue is brought to the 3GPP TSG T2 standards body (see page 2 for contact information) for discussion and resolution in order to provide interoperable implementations.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 22.140: "Multimedia Messaging Service; Stage 1".

[2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[3] void

[4] void

[5] IETF; STD 0011 (RFC 2822): "Internet Message Format", URL: http://www.ietf.org/rfc/rfc2822.txt.

[6] IETF; RFC 2046: "Multipurpose Internet Mail extension (MIME) Part Two: Media Types", URL: http://www.ietf.org/rfc/rfc2046.txt.

[7] void.

[8] void

[9] void

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[11] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[12] void

[13] void

[14] void

[15] void

[16] void

[17] void

[18] void

[19] void

[20] void

[21] void

[22] IETF; STD 0010 (RFC 2821): "Simple Mail Transfer Protocol", URL: http://www.ietf.org/rfc/rfc2821.txt.

[23] WAP Forum (November 1999): "WAP Wireless Session Protocol", WAP-WSP-19991105- , URL: http://www.wapforum.org/.

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[31] ITU-T Recommendation T.37 (06/98): "Procedures for the transfer of facsimile data via store-and-forward on the Internet".

[32] ITU-T Recommendation T.30 (1996): "Procedures for document facsimile transmission in the general switched telephone network".

[33] IETF; RFC 2421 (Sept. 1998): "Voice Profile for Internet Mail – version 2, VPIM" , URL: http://www.ietf.org/rfc/rfc2421.txt.

[34] IETF; STD 0053 (RFC 1939): "POP 3, Post Office Protocol - Version 3" , URL: http://www.ietf.org/rfc/rfc1939.txt.

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[36] Adobe Systems: "Tag Image File Format (TIFF), Version 6", URL:, http://www.adobe.com.

[37] 3GPP TR 23.039: "Interface protocols for the connection of Short Message Service Centres (SMSCs) to Short Message Entities (SMEs)".

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[40] 3GPP TS 26.233: "End-to-end transparent streaming Service (PSS); General Description".

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[44] IETF; RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies", URL: http://www.ietf.org/rfc/rfc2045.txt

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[53] IETF; RFC 1327: "Mapping between X.400(1988)/ISO 10021 and RFC 822", URL: http://www.ietf.org/rfc/rfc1327.txt.

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[55] Open Mobile Alliance; OMA-WAP-ProvCont-v1_1-20021112-C, Provisioning Content Version 1.1, URL: http://www.openmobilealliance.org/

[56] Open Mobile Alliance; OMA-MMS-ENC-v1_2, Multimedia Messaging Service, Encapsulation Protocol, Version 1.2, URL: http://www.openmobilealliance.org

NOTE: Reference [56] is the REL-5 MM1 stage 3 specification. OMA is committed to develop a REL-6 version. Consequently, reference [56] is to be replaced by the appropriate document identifier once the REL-6 MM1 stage 3 specification is approved within OMA.

[57] IETF; RFC 1870: "SMTP Service Extension for Message Size Declaration", URL: http://www.ietf.org/rfc/rfc1870.txt

[58] IETF; RFC 1652: "SMTP Service Extension for 8bit-MIME transport", URL: http://www.ietf.org/rfc/rfc1652.txt

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[61] IETF, RFC 2916: "E.164 number and DNS", URL: http://www.ietf.org/rfc/rfc2916.txt

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[64] 3GPP TS 23.066: "Support of Mobile Number Portability (MNP); Technical realization. Stage 2".

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[72] IETF; RFC 2111: "Content-ID and Message-ID Uniform Resource Locators", URL: http://www.ietf.org/rfc/rfc2111.txt.

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[76] "Digital Rights Management", Open Mobile AllianceTM, OMA-Download-DRM-v1_0, http://www.openmobilealliance.org/

[77] "DRM Rights Expression Language", Open Mobile AllianceTM, OMA-Download-DRMREL-v1_0, http://www.openmobilealliance.org/

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[80] 3GPP TS 32.240: "Charging Management; Charging Architecture and Principles ".

[81] 3GPP TS 32.270: "Charging Management; Multimedia Messaging Service (MMS) charging".

[82] Open Mobile Alliance; OMA-ERELD-MMS-v1_2-20030923-C, Enabler Release Definition for MMS Version 1.2, URL: http://www.openmobilealliance.org/

NOTE: Reference [82] is the REL-5 MM1 stage 3 specification. OMA is committed to develop a REL-6 version. Consequently, reference [82] is to be replaced by the appropriate document identifier once the REL-6 MM1 stage 3 specification is approved within OMA.

[83] 3GPP TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4 - Stage 2"

[84] IETF RFC 3588 "Diameter Base Protocol", URL: http://www.ietf.org/rfc/rfc3588.txt.

[85] Open Mobile Alliance; OMA-MMS-CONF-v1_2-20040219-C, MMS Conformance Document 1.2, URL: http://www.openmobilealliance.org/

NOTE: Reference [85] is the REL-5 MM1 stage 3 specification. OMA is committed to develop a REL-6 version. Consequently, reference [85] is to be replaced by the appropriate document identifier once the REL-6 MM1 stage 3 specification is approved within OMA.

[86] 3GPP TS 29.140: "MM10 interface based on Diameter protocol (Stage 3)".

[87] 3GPP TS 31.111: "USIM Application Toolkit (USAT) ".

3 Definitions and Abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions defined in 3GPP TR 21.905 [2] and 3GPP TS 22.140 [1] and the following apply:

Abstract message: information which is transferred between two MMS entities used to convey an MM and/or associated control information between these two entities

NOTE 1: The application protocol framework and technical realisation of MMS service features is described in terms of abstract messages in the present document.

Application Data: Information / data specific to an application other than the MMS User Agent / VASP which is intended to be transported without alteration by using MMS. Application Data may be of any content type and format.

Delivery Report: feedback information provided to an originator of MM (MMS User Agent or VASP) by an MMS Relay/Server about the status of the delivery of an MM

External Server: network entity/application of an external system such as Internet email, unified messaging system or facsimile to which MMs may be sent to and/or from which MMs may be received by an MMS User Agent via an MMS service provider

NOTE 2: An External Server is connected to that MMS Service Provider via non-MMS-specific protocols.

Forwarding MMS User Agent: MMS User Agent that is the intended recipient of an MM, that requests forwarding of the MM for delivery to other recipient(s) without having to first download the MM

Forwarded MM: MM originally sent from a sender to an intended recipient which is then forwarded to other recipient(s) and to which a delivery report and/or read-reply report may refer and which may be subject to further forwarding

Message ID: a unique identifier for an MM

Message Reference: a unique identifier for an MM indicating the location of the MM

MMBox: network storage associated with a user into which MMs, along with MM State and MM Flags, may be stored, retrieved, and deleted

MM State: the state of an MM within the MMBox, as one of several, mutually-exclusive enumerated values

MM Flags: a list of zero, one, or more keyword flags, defined by the MMS User Agent, associated with the MM

MM Delivery: act of a recipient MMS Relay/Server delivering an MM to a recipient MMS User Agent

MM Submission: act of an originator MMS User Agent submitting an MM to the originator MMS Relay/Server

MMSNA: Multimedia Messaging Service Network Architecture encompasses all the various elements that provide a complete MMS to a user

MMSE: collection of MMS-specific network elements under the control of a single administration

MMS Relay/Server: MMS-specific network entity/application that is under the control of an MMS service provider

NOTE 3: An MMS Relay/Server transfers messages, provides operations of the MMS that are specific to or required by the mobile environment and provides (temporary and/or persistent) storage services to the MMS.

MMS User Agent: application residing on a UE, an MS or an external device that performs MMS-specific operations on a user's behalf and/or on another application's behalf.

NOTE 4: An MMS User Agent is not considered part of an MMSE.

MMS VAS Applications: Applications providing Value Added Services (e.g. news service or weather forecasts) to MMS users.

Original MM: (initial) MM sent from a sender to a recipient and to which a delivery report and/or a read-reply report and/or a reply-MM may refer and/or which may be subject to being forwarded

Originator MMSE: MMSE associated with the sender of an MM

Originator MMS Relay/Server: MMS Relay/Server associated with the sender of an MM

Originator MMS User Agent: MMS User Agent associated with the sender of an MM

Originator VASP: VASP which is sending an MM

Read-Reply Report: feedback information to an originator MMS User Agent by a recipient MMS User Agent about the status of handling/rendering of an original MM in a recipient MMS User Agent

Recipient MMSE: MMSE associated with the recipient of an MM

Recipient MMS Relay/Server: MMS Relay/Server associated with the recipient of an MM

Recipient MMS User Agent: MMS User Agent associated with the recipient of an MM

Recipient VASP: VASP which is receiving an MM

Reply-MM: the first reply accepted by the recipient MMS Relay/Server (after checking the reply charging limitations, such as the latest time of submission) in case of reply-charging

Service provider identification: an identification for a service provider, e.g. a domain name, MCC+MNC, or a subset of the IMSI identifying the service provider. It is possible for the MMS Relay/Server to host several service providers. Mechanisms for this are implementation- and operator-specific.

Short code: Service provider specific address which is a string of alphanumeric characters

SOAP Attachment: Multimedia content, e.g. audio, image, text, presentation or a combination of different media types and/or formats, transferred from an MMS VASP to an MMS Relay/Server or vice versa.

Time stamp: The date, time and the additional information, e.g. UTC, GMT or time zone, which allows the unambiguous identification of time.

Transaction: message pair sent between an MMS User Agent and MMS Relay/Server, or between MMS Relay/Servers

3.2 Abbreviations

For the purposes of the present document, the abbreviations defined in [1] and [2] and the following apply:

CDR	Charging Data Record
DCF	DRM Content Format
DNS	Domain Name System
DRM	Digital Rights Management
EMA	Electronic Message Association
E-Mail	Electronic Mail
ENUM	Electronic Numbering
FQDN	Fully Qualified Domain Name
GW	Gateway
HTTP	Hypertext Transfer Protocol
IANA	Internet Assigned Numbering Authority
IETF	Internet Engineering Task Force
IMAP4	Internet Message Access Protocol
MIME	Multipurpose Internet Mail Extensions
MM	Multimedia Message
MMS	Multimedia Messaging Service
MMSE	Multimedia Messaging Service Environment
MMSNA	Multimedia Messaging Service Network Architecture
MSCF	Messaging Service Control Function
MTA	Mail Transfer Agent
PDU	Protocol Data Unit
POP3	Post Office Protocol Version 3
RADIUS	Remote Authentication Dial In User Service
RFC	Request for Comments
RTSP	Real Time Streaming Protocol
SDP	Session Description Protocol
SMIL	Synchronised Multimedia Integration Language
SMTP	Simple Mail Transfer Protocol
SOAP	Simple Object Access Protocol

SPI	Service Provider Identification
TLD	Top Level Domain
UA	User Agent
URI	Uniform Resource Identifiers
VAS	Value Added Service
VASP	Value Added Service Provider
VPIM	Voice Profile for Internet Mail
W3C	WWW Consortium
WAP	Wireless Application Protocol
WSP	WAP Session Protocol
XML	Extensible Markup Language

4 General Architecture

4.1 Overview

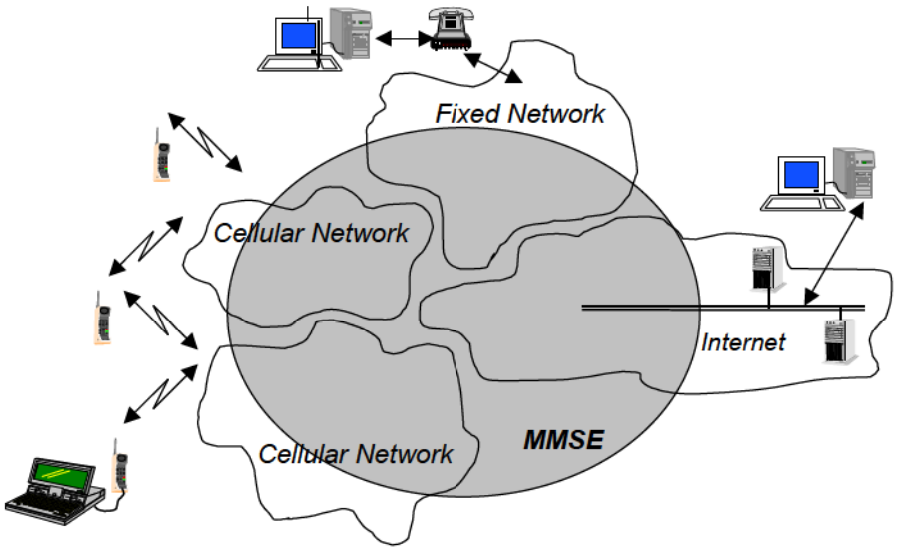


Figure 1: General view of MMS provision within the different networks

Figure 1 shows a generalised view of the Multimedia Messaging Service architecture. It shall combine different networks and network types and shall integrate messaging systems already existent within these networks. The terminal operates with the Multimedia Messaging Service Environment, MMSE. This environment may comprise 2G and 3G networks, 3G networks with islands of coverage within a 2G network and roamed networks. The MMSE provides all the necessary service elements, e.g. delivery, storage and notification functionality. These service elements may be located within one network or distributed across several networks or network types.

4.2 Involved MMS Elements

Figure 2 shows that multimedia messaging may encompass many different network types. The basis of connectivity between these different networks shall be provided by the Internet protocol and its associated set of messaging protocols. This approach enables messaging in 2G and 3G wireless networks to be compatible with messaging systems found on the Internet.

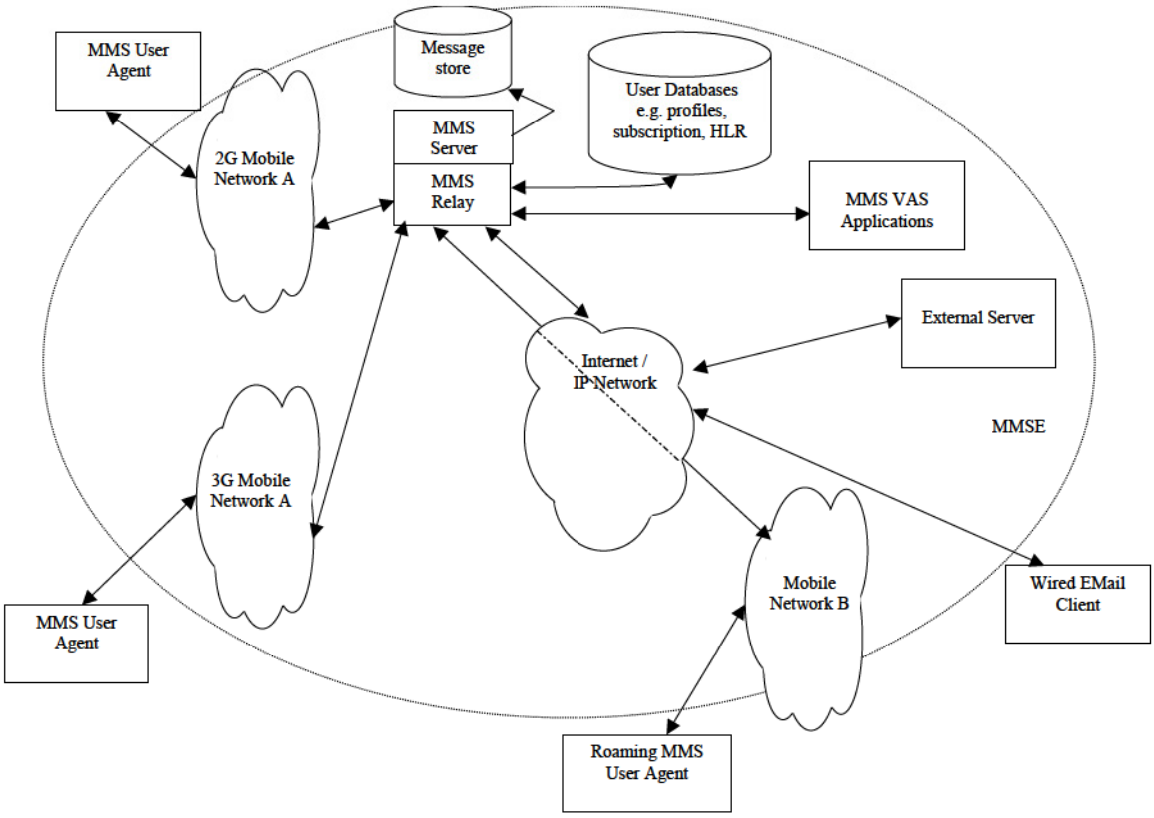


Figure 2: MMS Architectural Elements

MMSNA

The Multimedia Messaging Service Network Architecture encompasses all the various elements that provide a complete MMS to a user (including interworking between service providers).

MMSE

The MMSE is a collection of MMS-specific network elements under the control of a single administration. In the case of roaming the visited network is considered a part of that user's MMSE. However, subscribers to another service provider are considered to be a part of a separate MMSE.

MMS Relay/Server

The MMS Relay/Server is responsible for storage and handling of incoming and outgoing messages and for the transfer of messages between different messaging systems. Depending on the business model, the MMS Relay/Server may be a single logical element or may be separated into MMS Relay and MMS Server elements. These may be distributed across different domains.

The MMS Relay/Server should be able to generate charging data (Charging Data Record - CDR) when receiving MMs from or when delivering MMs to another element of the MMSNA according to 3GPP TS 32.270 [81]. The MMS Relay/Server should be able to generate charging data for VASP-related operations.

MMS User Databases

This element may be comprised of one or more entities that contain user related information such as subscription and configuration (e.g. user profile, HLR).

MMS User Agent

The MMS User Agent resides on a UE, an MS or on an external device connected to a UE/MS. It is an application layer function that provides the users with the ability to view, compose and handle MMs (e.g. submitting, receiving, deleting of MMs).

MMS VAS Applications

The MMS VAS Applications offer Value Added Services to MMS users. There could be several MMS VAS Applications included in or connected to an MMSE. MMS VAS Applications may be able to generate CDRs.

4.3 Addressing

MMS shall support the use of E-Mail addresses (RFC 2822) [5] or MSISDN (E.164) or both to address the recipient of an MM. MMS may support the use of service provider specific addresses to address the recipient of an MM. In the case of E-Mail addresses standard internet message routing should be used. MMS may support short codes to address Value Added Services.

NOTE: The length of short codes shall be defined by the service provider and will not be specified for this release.

The usage of MSISDN for addressing a recipient in a different MMS service provider's domain shall be possible. For that the need of MSISDN translation to a routable address has been identified. Service provider specific addresses may be used to e.g. deliver messages to MMS VAS Application within one MMSE.

MMS connectivity across different networks (MMSEs) is provided based on Internet protocols. According to this approach, each MMSE should be assigned a unique domain name (e.g. mms.operatora.net).

MMS recipient addresses provided by an MMS User Agent may be in a format of an RFC 2822 routable address, e.g. E-Mail address, or other formats, such as E.164 or service provider specific addresses. In those cases where a non-routable address is used to specify a recipient and the recipient belongs to another MMSE or the recipient is outside of any MMSE, it is required to translate the address to an RFC 2822 routable address format. The sender MMS Relay/Server's shall make this mapping before routing forward the message to the recipient's MMS Relay/Server.

The mapping to the correct recipient's MMS Relay/Server domain name is described in clause 7.2.1.

MMS shall support address hiding i.e. anonymous messages where the sender's address is not shown to the recipient MMS User Agent. If the peer entity is not known to be an MMS Relay/Server the originator MMS Relay/Server shall not provide the originator address. If the peer entity is known to be an MMS Relay/Server, both the originator address and request of address hiding shall be forwarded to the recipient MMS Relay/Server. The recipient MMS Relay/Server shall not show the originator address to the recipient MMS User Agent.

4.4 Message Size Measurement

The Message size is defined as the sum of the Subject information element size and the size of all the MM element(s), including the Presentation object (e.g. SMIL). Other information elements of a MM shall be excluded from the message size calculation.

4.4.1 Size of Subject information element

The size of the Subject information element (prior to truncation – if any) shall be calculated as the length of the subject field in octets excluding the “Subject: ” token.

4.4.2 Size of an MM element

The size of an MM element shall be calculated as the total number of octets of the media object, i.e. raw data without any boundaries or additional headers which are due to MIME-based encodings of the MM.

In case of an MM element being a multipart/mixed or multipart/related MIME message, the total number of octets contained in the body of that MIME message (i.e. that MM element) shall be counted including only the boundaries and additional headers which are part of the MIME message (i.e. that MM element).

NOTE 1: It is understood that due to the different encoding used in the MM4 reference point for the Subject field, there can be a slight discrepancy in the message size calculated over the MM1 and MM4 reference points.

NOTE 2: The message size of a submitted MM might differ from the message size of a retrieved MM if content adaptation is performed prior to its retrieval.

5 Functional Description of Involved MMS Elements

5.1 MMS User Agent

5.1.1 MMS User Agent operations

The MMS User Agent shall provide the following application layer functionalities:-

- the retrieval of MMs (initiate MM delivery to the MMS User Agent);
- terminal capability negotiation.

The MMS User Agent may provide additional application layer functionalities such as:-

- the MM composition ;
- the presentation of the MM Size (as defined in clause 4.4) prior to MM submission;
- the MM submission;
- the MM presentation;
- the presentation of notifications to the user;
- the signing of an MM on an end-user to end-user basis;
- the decryption and encryption of an MM on an end-user to end-user basis;
- all aspects of storing MMs on the terminal;
- handling of MMS-related information on the (U)SIM;
- management and presentation of MMBox content;
- the handling of external devices;
- the user profile management;
- transport of application data;
- replacing a previously retrieved MM with a newly retrieved MM;
- cancelling a previously retrieved MM.

This optional list of additional functionalities of the MMS User Agent is not exhaustive.

5.1.1.1 MMS Retrieval Modes

MMS allows for the retrieval of MMs in a manual or automatic fashion. The retrieval mode is a terminal behavior and is based on different factors. These factors may include roaming conditions, message size, MMS User Agent configuration, recommendation from the MMS Relay/Server for retrieval, the originator of an MM, and transport of application data.

In automatic mode the retrieval of an MM and its storage to local memory is accomplished without any interaction with the end user. Depending on terminal implementation, the MM may be displayed to the end user with or without any pre-notice. In this mode the end user is probably not aware of the MM notification and whether it's stored on the device or not.

In manual mode the end user is made aware of the MM notification and is allowed to make a decision whether to download the MM or not. In this mode the end user is aware of an MM notification and where it's stored on the terminal.

5.1.2 Minimum set of supported formats

In order to guarantee a minimum support and compatibility between multimedia messaging capable terminals, the following media and file formats shall be supported as defined below and in 3GPP TS 26.140 [74].

5.1.2.1 Interoperability with SMS

In order to guarantee SMS interoperability, SMS 3GPP TS 24.011 [11] RP-DATA RPDU encapsulation defined in clause 7.3.1 shall be supported. MIME type "application/vnd.3gpp.sms" shall be used for this purpose. In order to maintain backward compatibility, MIME type "application/x-sms" shall be supported by the MMS UA for mobile-terminated messages only.

5.1.2.2 Plain Text

Plain Text coding used inside MMS shall be according to [74].

5.1.2.3 Speech

Speech coding used inside MMS shall be according to [74].

5.1.2.4 Audio

Audio coding used inside MMS shall be according to [74].

5.1.2.5 Synthetic audio

Synthetic audio coding used inside MMS shall be according to [74].

5.1.2.6 Still Image

Still image coding used inside MMS shall be according to [74].

5.1.2.7 Bitmap graphics

Bitmap graphics coding used inside MMS shall be according to [74].

5.1.2.8 Video

Video coding used inside MMS shall be according to [74].

5.1.2.9 Vector graphics

Vector graphics coding used inside MMS shall be according to [74].

5.1.2.10 File Format for dynamic media

Support for file formats for dynamic media used inside MMS shall be according to [74].

5.1.2.11 Media synchronization and presentation format

Support for media synchronization and presentation format used inside MMS shall be according to [74].

5.1.2.12 DRM format

Support for DRM protected MM elements (i.e. 'DRM Message' and 'DRM Content Format (DCF)') shall be according to section 7.1.15.

5.2 MMS Relay/Server

The MMS Relay/Server is responsible for storage and notification, reports, and general handling of messages. The MMS Relay/Server may also provide convergence functionality between External Servers and MMS User Agents and thus enable the integration of different server types across different networks. An Example can be found in Annex A.

It is possible to separate the MMS Relay/Server element into MMS Relay and MMS Server elements, but an allocation of the MMS Relay/Server functionalities to such elements is not defined in this release.

The MMS Relay/Server shall provide the following functionalities:

- receiving and sending MM;
- conversion of messages arriving at the recipient MMS Relay/Server from legacy messaging systems to MM format (e.g. facsimile to MM) if interworking with legacy messaging systems (MM3) is supported;
- conversion of MMs leaving the originator MMS Relay/Server to legacy messaging systems to the appropriate message format (e.g. MM to internet email) if interworking with legacy messaging systems (MM3) is supported;
- message content retrieval;
- MM notification to the MMS User Agent;
- generating delivery reports;
- routing forward MMs and read-reply reports;
- address translation;
- temporary storage of messages;
- ensuring that messages are not lost until successfully delivered to another MMSE element;
- DRM functionalities according to section 7.1.15.

The MMS Relay/Server should provide additional functionalities such as:

- generating charging data records (CDR);
- negotiation of terminal capabilities;
- transport of application data.

The MMS Relay/Server may provide additional functionalities such as:

- MM forwarding;
- address hiding;
- persistent storage of messages;
- controlling the reply-charging feature of MMS;.
- relaying Message Distribution Indicator.

The MMS Relay/Server can provide additional functionalities which are not further specified in this release such as:-

- enabling/disabling MMS function;
- personalising MMS based on user profile information;

- MM deletion based on user profile or filtering information;
- truncating the subject in a notification, e.g., in order to optimize for underlying bearer limitations;
- media type conversion;
- media format conversion;
- screening of MM;
- checking terminal availability;
- managing the message properties on servers (e.g. voicemail or email server) integrated in the MMSE (consistency) (only applicable if interworking with legacy messaging systems (MM3) is supported);
- detecting whether the recipient user is roaming or not;
- detecting whether the recipient handset is MMS capable or not.

This list of additional optional functionalities of the MMS Relay/Server is not exhaustive.

5.2.1 Persistent Network-based Storage (MMBoxes)

An optional feature of MMS is the support of persistent, network-based storage, called an "MMBox", a logical entity associated with the MMS Relay/Server into which Multimedia Messages (MMs) may be stored, retrieved, and deleted. Depending upon an operator's configuration, each subscriber may have her MMBox configured to automatically store incoming and submitted MMs, or, through supporting MMS User Agents, request that specific MMs be persistently stored on a case-by-case basis.

5.3 External Servers

Several External Servers may be included within or connected to an MMSE, e.g. E-Mail Server, SMS Server (SMSC), Fax. Convergence functionality between External Servers and MMS User Agents is provided by the MMS Relay/Server which enables the integration of different server types across different networks. Several Examples can be found in Annex A.

5.4 Messaging Service Control Function (MSCF)

The MSCF is a functional entity which may be connected to the MMS Relay/Server to execute messaging related service logic. It may influence addressing, routeing and charging for multimedia messages. Furthermore it may control access rights of the user.

The MSCF may be co-located with the gsmSCF [83].

5.5 MMS User Databases and HLR

The MMS may have access to several User databases. These may consist of e.g. user profile database, subscription database, HLR.

These User Databases shall provide:-

MMS user subscription information;

information for the control of access to the MMS;

information for the control of the extent of available service capability (e.g. server storage space);

a set of rules how to handle incoming messages and their delivery;

information of the current capabilities of the users terminal.

The location of the User Databases and the access to them are outside the scope of this release.

5.6 MMS VAS Applications

The MMS VAS Applications provide value added services to the MMS users. In many ways MMS VAS Applications behave like a fixed MMS User Agent. However, MMS VAS Applications may provide some additional features like MM recall between MMS VAS Applications and MMS Relay/Server which are not available for MMS User Agents.

The present document does not cover what kind of applications might be available and how the MMS VAS Application provide these services.

MMS VAS Applications may be able to generate CDRs when receiving MMs from MMS Relay/Server and when submitting MMs to MMS Relay/Server. The interaction between an MMS Relay/Server and the MMS VAS Application should be provided through the MM7 interface, as described in clause 6.9.

6 MMSE Architecture and Interfaces

This clause defines the Multimedia Messaging framework. The application protocol framework described by the means of abstract messages and the technical realisation of MMS service features are defined in clause 8.

6.1 MMS Reference Architecture

Figure 3 shows the MMS Reference Architecture and identifies reference points within an MMSNA that are further described below. Abstract messages are indicated in clause 8 that describe the logical message exchange on these reference points on a high-level basis.

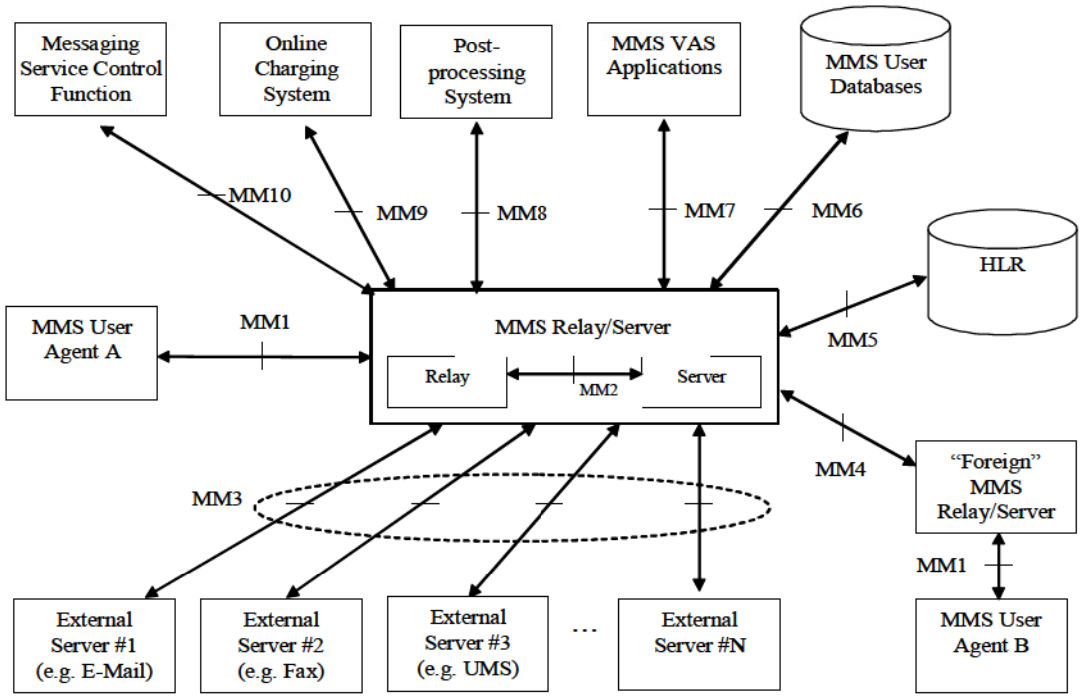


Figure 3: MMS Reference Architecture

The interfaces in the MMS Reference Architecture are:

MM1: The reference point between the MMS User Agent and the MMS Relay/Server.

MM2: The reference point between the MMS Relay and the MMS Server.

MM3: The reference point between the MMS Relay/Server and external (legacy) messaging systems.

MM4: The reference point between the MMS Relay/Server and another MMS Relay/Server that is within another MMSE.

MM5: The reference point between the MMS Relay/Server and the Home Location Register (HLR).

MM6: The reference point between the MMS Relay/Server and the MMS User Databases.

MM7: The reference point between the MMS Relay/Server and MMS VAS Applications.

MM8: The reference point between the MMS Relay/Server and the post-processing system.

MM9: The reference point between the MMS Relay/Server and the online charging system.

MM10: The reference point between the MMS Relay/Server and a Messaging Service Control Function (MSCF).

6.2 Protocol Framework

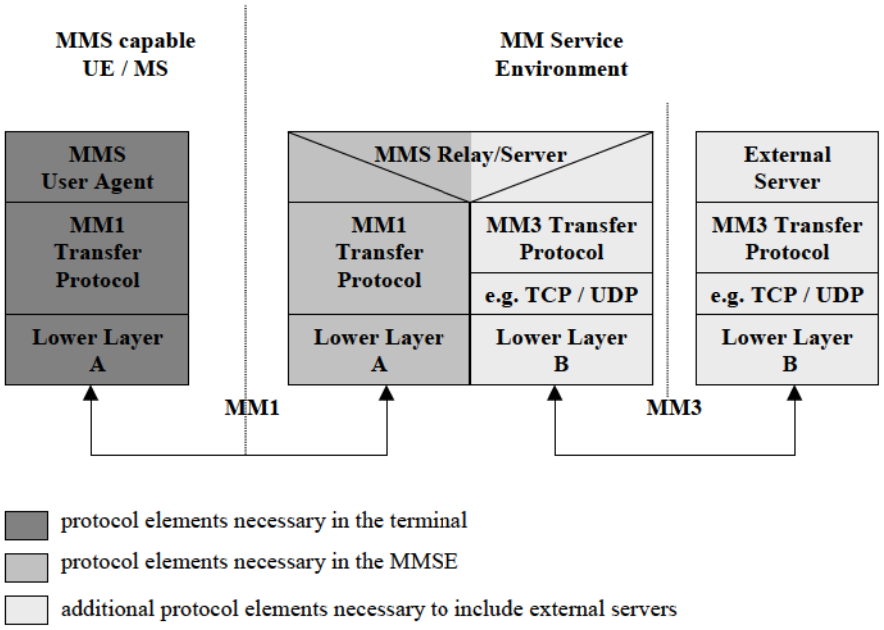


Figure 4: Protocol Framework to provide MMS

To provide implementation flexibility, integration of existing and new services together with interoperability across different networks and terminals, the MMS shall make use of the protocol framework outlined in figure 4. In this framework the MMS User Agent communicates with the MMS Relay/Server, which may communicate with External Servers. This MMS Relay/Server may provide convergence functionality between External Servers and MMS User Agents and thus enables the integration of different server types across different networks.

6.3 MM1: MMS Relay/Server – MMS User Agent

Reference point MM1 is used to submit Multimedia Messages from MMS User Agent to MMS Relay/Server, to let the MMS User Agent pull MMs from the MMS Relay/Server, let the MMS Relay/Server push information about MMs to the MMS User Agent as part of an MM notification, and to exchange delivery reports between MMS Relay/Server and MMS User Agents.

Details for implementation of the MM1 transfer protocol are described in Annex B. Other implementations are not defined in the present document in this release.

6.4 MM2: MMS Relay – MMS Server

This reference point is not specified in this release of the present document. It may be specified in a future release of the present document.

6.5 MM3: MMS Relay/Server – External Servers

Reference point MM3 is used by the MMS Relay/Server to send Multimedia Messages to and retrieve MMs from servers of external (legacy) messaging systems that are connected to the service provider's MMS Relay/Server.

This reference point is further elaborated in clause 8.3. In addition, several examples of realisations of reference point MM3 between the MMS Relay/Servers and External Servers can be found in Annex A.

6.6 MM4: Interworking of different MMSEs

Reference point MM4 between MMS Relay/Servers belonging to different MMSEs is used to transfer messages between them. Interworking between MMS Relay/Servers shall be based on SMTP according to STD 10 (RFC 2821) [22] as depicted in figure 5.

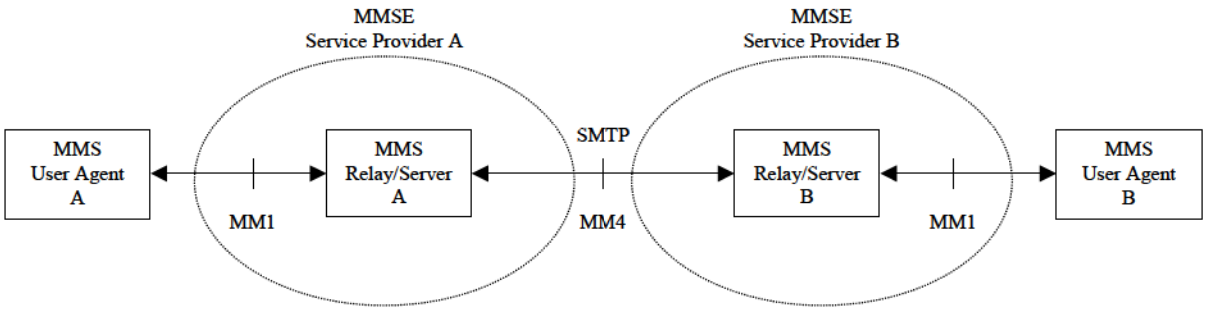


Figure 5: Interworking of different MMSEs

Interworking between different MMS service providers is further elaborated in clause 8.4.

6.7 MM5: MMS Relay/Server – HLR

Reference point MM5 may be used to provide information to the MMS Relay/Server about the subscriber. If this reference point is provisioned then it shall use existing MAP operations (e.g. procedures for determining the location of the mobile, procedures for alerting SMS service centres). Future releases may elaborate this area further.

In case of using SMS as the bearer for notification this reference point is not necessary.

6.8 MM6: MMS Relay/Server – MMS User Databases

This reference point is outside the scope of this release of the present document.

6.9 MM7: MMS Relay/Server – MMS VAS Applications

Reference point MM7 is used to transfer MMs from MMS Relay/Server to MMS VAS applications and to transfer MMs from MMS VAS applications to MMS Relay/Server. This functionality is further elaborated in section 7.1.13. This reference point shall be based on SOAP 1.1 [68] and SOAP messages with attachments [69] using an HTTP

transport layer. Future releases may update this protocol decision to use a standardized version of SOAP and support additional transport layer implementations.

6.10 MM8: MMS Relay/Server – Post-processing system

Reference point MM8 is used to transfer MMS specific CDRs from MMS Relay/Server to the operators post-processing system, refer TS 32.240 [80]. The functionality is further elaborated in TS 32.270 [81].

6.11 MM9: MMS Relay/Server – Online charging system

Reference point MM9 is used to transfer charging messages from MMS Relay/Server to the online charging system, refer TS 32.240 [80]. This functionality is further elaborated in TS 32.270 [81].

6.12 MM10: MMS Relay/Server – Messaging Service Control Function (MSCF)

Reference Point MM10 is used to transfer multimedia message specific information between the MMS Relay/Server and an external MSCF, e.g. for number translation purposes.

This reference point shall be based on Diameter [84].

7 MMS Service Behaviour Description

7.1 MMS services offered

7.1.1 Submission of a Multimedia Message in the originator MMSE

When a user intends to send an MM to one or several destinations the MM shall be submitted to the originator MMS Relay/Server.

The support for submission of MMs is optional for MMS User Agents. The support for submission of MMs is mandatory for MMS Relay/Servers.

If an MMS User Agent supports submission of MMs the MMS User Agent shall be able to:

- Indicate the address of the MM recipient;
- Identify the MIME content type of the message.

If a MMS User Agent supports submission of MMs the MMS User Agent may be able to:

- Request a delivery report for the message;
- Request a read-reply report for the message;
- Provide a time stamp for the time of submission of the message;
- Set the earliest desired time of delivery for the message;
- Set the desired time of expiry for the message;
- Indicate the address of the MM originator;
- Set further message qualifications (e.g. priority, message class, subject);

- Request the MM originator's address being hidden from the recipient MMS User Agent;
- Indicate the sender's willingness to pay the charge for one reply-MM per recipient;
- Indicate a reply-charging limitation;
- Request that a copy of the submitted MM be stored in the originator's MMBox, in addition to being delivered to the recipient;
- Provide guideline for content adaptation (e.g. if content adaptation for the MM is restricted);
- Provide content information (e.g. content class [85] , presence of DRM content).

Upon reception of an MM from an originator MMS User Agent the originator MMS Relay/Server

- shall assign a Message Identification to the MM and immediately provide the originator MMS User Agent with this Message Identification;
- shall retain the MM until the earliest desired time of delivery, if the optional feature of earliest time of delivery is supported by the originator MMS Relay/Server. If this feature is not supported then the MM is immediately routed forward;
- shall provide the peer entity with a time stamp if not provided by the originator MMS User Agent. The originator MMS Relay/Server may also override the MMS User Agent's time stamp;
- shall insert the originator's address into the MM if not provided by the originator MMS User Agent;
- shall pass the originator's address to the peer entity if the peer entity is known to be a MMS Relay/Server;
- shall route forward the request for address hiding unaltered to the recipient MMS Relay/Server if the peer entity is known to be an MMS Relay/Server;
- shall pass the originator's address to the peer entity if the peer entity is not known to be an MMS Relay/Server and address hiding has not been requested by the originator MMS User Agent;
- shall not pass the originator's address to the peer entity and should override the address provided by the originator MMS User Agent in the MM to an "anonymous" address if the peer entity is not known to be an MMS Relay/Server and address hiding has been requested by the originator MMS User Agent;
- may override the originator's address provided by the originator MMS User Agent in the MM (subject to MMS service provider's preferences);
- shall resolve the MM recipient's address(es);
- if an MMBox is supported and enabled for the originator, shall store a copy of the MM into the originator's MMBox automatically, according to the service configuration for the originator or as requested by the MMS User Agent;
- shall route the MM towards the MM recipients;
- should pass the indication whether or not a delivery report is requested unaltered when routing the MM towards the MM recipient(s);
- shall pass the indication whether or not a read-reply report is requested unaltered when routing the MM towards the MM recipient(s);
- shall pass the indication about MIME content type of the message and message qualifications (e.g. priority, message class, subject) unaltered when routing the MM towards the MM recipient(s);
- shall generate a delivery report indicating "indeterminate" status of the MM's delivery if a delivery report was requested by the originator MMS User Agent and if the peer entity the MM is routed forward to is not known by the originator MMS Relay/Server;

- may reject the MM submission if the MM is identified as a duplicate of an MM already stored;
- shall route forward, if available, the guideline for content adaptation to the peer entity if the peer entity is known to be a MMS Relay/Server.
- shall route forward, if available, the content information to the peer entity if the peer entity is known to be a MMS Relay/Server.

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A special case is where the recipient MMS Relay/Server is also the originator MMS Relay/Server. In this case the MM does not have to be routed forward.

7.1.2 Reception of a Multimedia Message in the recipient MMSE

Upon reception of an MM the recipient MMS Relay/Server

- may verify the MM recipient's user profile(s);
- shall store the MM at least until
  - the associated time of expiry is reached,
  - the MM is delivered,
  - the recipient MMS User Agent requests the MM to be routed forward or
  - the MM is rejected;
- may store the MM into an MMBox.

The term "associated time of expiry " refers to either the desired time of expiry set by the originator MMS User Agent or an MMS Relay/Server time of expiry setting.

- shall generate a notification to the recipient MMS User Agent.

Incoming messages from legacy systems may be expected to be converted to MMs.

7.1.2.1 Multimedia Message Notification

With the MM notification the recipient MMS User Agent shall receive a message reference that can be used for retrieving the MM from the recipient MMS Relay/Server. The message reference that is conveyed in a notification shall at least be valid throughout the message expiry period, till the successful retrieval of the MM or until the MM was rejected.

With the MM notification the recipient MMS User Agent may receive additional information on the MM.

If the originator MMS User Agent has requested address hiding the recipient MMS Relay/Server shall not include the originator address into the MM notification.

The MMS Relay/Server may include an indication in the MM notification recommending manual retrieval mode. This recommendation may be based on user settings in the User Profile.

The MMS Relay/Server may truncate the subject field in the notification, e.g., in order to adapt the size of the MM notification to limitations from the underlying bearer.

In a response to the notification the MMS User Agent shall be able to

- reject the MM or
- retrieve the MM, either immediately or at a later time (i.e. defer the MM retrieval), either manually or automatically, as possibly determined by the operator configuration and user profile.

The retrieval mode employed by the recipient MMS User Agent for a particular MM may be based either on the user settings in the terminal or on the recommendation carried in the MM notification. The recipient MMS User Agent may follow this recommendation to retrieve the MM, through manual retrieval.

For any MM for which the retrieval has been deferred, the MMS User Agent may request deletion on the MMS Relay/Server instead of MM retrieval.

7.1.3 Retrieval of a Multimedia Message in the recipient MMSE

The recipient MMS User Agent shall be able to request retrieval of an MM from the recipient MMS Relay/Server based on the Message Reference received in a notification. If MMBoxes are supported, the MMS User Agent shall be able to request retrieval of an MM from the user's MMBox, based on a Message Reference received from a previous MMBox operation.

Within a retrieval request the recipient MMS User Agent may indicate a size restriction of the returned MM (i.e., maximum size) that the MMS Relay/Server is to use in processing the retrieval request.

Upon retrieval request the recipient MMS Relay/Server

- shall deliver the MM to the recipient MMS User Agent
- may perform data adaptation based on user profile and/or, MMS User Agent capabilities and/or, guideline and/or content information provided by the originator
- shall not provide the MM originator address to the MM recipient if the originator MMS User Agent requested its address to be hidden from the MM recipient
- shall provide the MM originator address to the MM recipient if the originator MMS User Agent did not request its address to be hidden from the MM recipient and if the MM originator address is available at the recipient MMS Relay/Server
- may provide an alias or clarifying text (e.g. "anonymous address" or "unknown address") in the originator address field instead of providing the originator address to the recipient MMS User Agent, if the originator has requested address hiding or the original message does not contain the originator address
- shall give an indication to the recipient MMS User Agent that a delivery report is requested if such a delivery report has been requested by the originator MMS User Agent
- shall give an indication to the recipient MMS User Agent that a read-reply report is requested if such a read reply report has been requested by the originator MMS User Agent
- shall indicate the MIME content type of the MM to the recipient MMS User Agent
- shall provide other available message qualifications unaltered to the recipient MMS User Agent
- shall provide the time stamp of the MM unaltered to the recipient MMS User Agent
- shall store messages in the network until the recipient MMS User Agent becomes reachable (e.g. user moves back into coverage, switches MMS User Agent on) or until the MM expires
- should provide the recipient MMS User Agent with a list of addresses of forwarding MMS User Agents for the MM if the MM was forwarded and the address information is available to the recipient MMS Relay/Server
- should not deliver the MM (or any adaptation of the MM) to the recipient MMS User Agent unless the size restriction set by the MMS User Agent is met
- may provide, if available, the content information to the recipient MMS User Agent
- may forward an indication, coming from a VASP, to the recipient MMS User Agent that the MM replaces the content of a specific previous MM.

Upon retrieving a new MM, coming from a VASP, that replaces a previously retrieved MM, the recipient MMS User Agent should try to replace the previously retrieved MM with the new MM, as indicated in the newly retrieved MM. MMS User Agent may provide means (e.g. terminal setting) to a user to forbid such replacement.

Content information provided by the originator of an MM may be used by the recipient MMS Relay/S erver for various purposes. For instance, if the content class [85] is supported by the recipient and the content does not contain any DRM-protected content, the MMS Relay/Server may identify that adaptation is not required without need for further analysis of the message. Content information may also be used by the recipient MMS User Agent for quick and easy handling of the content of a MM (e.g. invoking DRM-related activities like encoding and decoding, storing content, preparing MM for presentation).

While the recipient MMS Relay/Server is adapting data, the adaptation rule based on DRM-protected content shall prevail the adaptation guideline provided by the originator.

The recipient MMS Relay/Server shall be able to ignore a request from an originator that the content of the MM will not be subjected to content adaptation, e.g. based on MMS service provider / network operator configuration.

In a response to an MM's delivery the recipient MMS User Agent may be able to

- request a delivery report not to be generated by the MMS Relay/Server.

7.1.3.1 Terminal Capability Negotiation

An MMS User Agent shall support Terminal Capability Negotiation. An MMS Relay/Server shall support Terminal Capability Negotiation.

Within a request for delivery of an MM the recipient MMS User Agent shall be able to indicate its capabilities towards the recipient MMS Relay/Server.

The recipient MMS User Agent may indicate its capabilities towards the recipient MMS Relay/Server by transmitting:

- a set of information describing the terminal's capabilities, including a binary flag indicating whether or not the terminal supports Application data
- a link (e.g. URI) to a database where the MMS Relay/Server can fetch a set of information describing the terminal's capabilities, and/or
- a differential set of information indicating changes to a previously indicated set of terminal capability information.

The detailed definition of the specific mechanism for terminal capability negotiation shall be defined by the MM1 implementation (cf. Annex B). The mechanism for terminal capability negotiation shall ensure that the MMS Relay/Server is provided with the information describing the MMS User Agent's capabilities within every request for delivery of an MM.

E.g. in the WAP/OMA implementation of MMS, in case an underlying WSP session is established between the MMS User Agent and an intermediate WAP Gateway, the MMS User Agent indicates its capabilities towards the WAP Gateway only after the initial set-up of the underlying WSP session or spontaneously following a change in terminal capabilities. The WAP Gateway, however, caches the terminal capability information and passes these on to the MMS Relay/Server within every request for delivery of an MM. Intermediate proxies on the MM1 reference point may also be involved in terminal capability negotiation and/or content adaptation.

Upon reception of such a delivery request the recipient MMS Relay/Server should use the information about the capabilities of the recipient MMS User Agent in preparation of MMs to be delivered to the recipient MMS User Agent. The MMS Relay/Server should adjust an MM to be delivered that contains media types and media formats that are not supported by the recipient MMS User Agent. This adjustment might involve the deletion or adaptation of those unsupported media types and media formats.

The MMS User Agent's capability information should include

- the maximum supported size of an MM,
- the maximum supported resolution of an image,
- a list of supported media types and media formats (e.g. MIME types),
- a list of supported character sets,
- a list of preferred languages,

- the maximum supported colour depth,
- an indication whether or not the recipient MMS User Agent supports streaming for the retrieval of MM contents as specified in clause 7.1.7 ,
- an indication if the recipient MMS User Agent supports transporting application data.

The MMS User Agent's capability information shall include:

- an indication of which Digital Rights Management methods are supported by the recipient MMS User Agent for protecting MM elements as specified in clause 7.1.15.

This information may include additional information related to the MMS implementation (cf. Annex B).

7.1.4 Forwarding of a Multimedia Message

This part of the MMS service describes the mechanism by which an MMS User Agent may request the corresponding MMS Relay/Server, that an MM for which the MMS User Agent is the intended recipient (and is notified of the MM) be forwarded to other specified recipient(s) MMS User Agent(s) whose address(es) shall be specified by the forwarding MMS User Agent, without having to first retrieve the MM.

The support for originating a request that a specific MM be forwarded is optional for the MMS User Agent.

The support for forwarding an MM, in response to a request from a MMS User Agent that a specific MM be forwarded is optional for the MMS Relay/Server.

The original MM is forwarded to a new recipient(s) with the forwarding MMS User Agent's address being provided but without additional content, and without affecting the elements of the original MM. Some additional information elements e.g. ,reply-charging request,delivery report, read-reply report, i.e. requests for reports which are to provide feedback on the forwarded MM to the forwarding MMS User Agent, may be supplied.

Upon requesting an MM to be forwarded the MMS User Agent:

- shall indicate the address of the MM recipient(s);
- shall provide the message reference provided in the MM Notification;
- shall not request address hiding;
- shall not generate a read-reply report to the originator MMS User Agent even if a read-reply report is requested;
- may indicate the address of the Forwarding MMS User Agent (i.e. it's own address);
- may request that a copy of the forwarded MM be stored in the MMBox;
- may provide a time stamp for the time of submission of the request to forward the MM;
- may set the desired time of expiry for the forwarded MM;
- may set the earliest desired time of delivery for the forwarded MM;
- may request a delivery report for the forwarded MM;
- may request a read-reply report for the forwarded MM;
- may indicate the willingness of the forwarding MMS user agent to pay for a reply for the forwarded MM and convey the reply-charging limitations. In this case, forwarding MMS User Agent behaves as the originator MMS User Agent to support reply-charging function. Fowarding MMS User Agent shall not be allowed to forward the reply-charging information set by the originator MMS User Agent.

Upon reception of a request from a forwarding MMS User Agent to forward an MM, the forwarding MMS Relay/Server

- shall assign a Message Identification to the forwarded MM and immediately provide the forwarding MMS User Agent with this Message Identification;

- shall provide status information on the MM forward request to the forwarding MMS User Agent;
- shall retain the forwarded MM until the earliest desired time of delivery, if the optional feature of earliest time of delivery is supported by the MMS Relay/Server of the forwarding MMS User Agent. If this feature is not supported then the MM is immediately routed forward;
- is responsible for copying the MM into the MMBox, if the MMBox is supported, enabled, and if requested. In addition, the stored MM will have new Recipient address, Sender address, and Date and time information elements appended to the stored MM in such a way that the forwarding history of those information elements is accumulated with repeated forwardings, without losing the Recipient and Sender addresses, and Date and time of the original MM;
- may provide a time stamp of the MM submission;
- shall not provide the MM originator's address if the originator MMS User Agent requested its address to be hidden from the MM recipient(s);
- shall not route forward the request for address hiding of the MM originator;
- shall provide the address of the MMS User Agent that requested forwarding of the MM;
- shall provide a time stamp for the request to forward the MM. It may also override the forwarding MMS User Agent's time stamp;
- shall insert the forwarding MMS User Agent's address into the forwarded MM if not yet provided;
- may override the forwarder's address provided by the forwarding MMS User Agent in the forwarding request (subject to MMS service provider's preferences);
- shall resolve the recipient's address(es) of the forwarded MM;
- shall route the forwarded MM towards the MM recipient(s);
- shall pass the indication whether or not a delivery report is requested unaltered when routing the forwarded MM towards the MM recipient(s);
- shall pass the indication whether or not a read-reply report is requested unaltered when routing the forwarded MM towards the MM recipient(s);
- shall generate a delivery report indicating "indeterminate" status of the MM's delivery if a delivery report was requested by the last MMS User Agent that handled the message and if the peer entity the MM is routed forward to is not known to the MMS Relay/Server of the forwarding MMS User Agent;
- shall provide the recipient MMS Relay/Server(s) with a count of the number of times that the particular MM was forwarded;
- shall provide the recipient MMS Relay/Server(s) with a list of addresses of forwarding MMS User Agents for the MM;
- shall generate a delivery report to the originator MMS User Agent if a delivery report is requested.

A special case is where the recipient MMS Relay/Server is also the forwarding MMS Relay/Server. In this case the MM does not have to be routed forward.

7.1.5 Delivery Report

The MMS Relay/Server shall support the delivery reporting service. Delivery reports shall only be generated for MMs.

The originator MMS User Agent or VASP may be able to request a delivery report for a specific MM.

Within an MM notification or upon MM retrieval the recipient MMS User Agent may receive an indication that a delivery report is requested for the MM.

Within either a response to a notification or a response to an MM's delivery, the recipient MMS User Agent may request a delivery report not to be generated by the MMS Relay/Server. When a VASP has requested the delivery report (via MM7) the MMS Relay/Server shall send the delivery report regardless of the MMS User Agent's request.

The originator MMS Relay/Server shall generate a delivery report if a delivery report has been requested by the originator MMS User Agent or VASP

- upon routing forward the MM, in case the peer entity is not known by the MMS Relay/Server;
- upon routing forward the MM, in case that originator is VASP.

The originator MMS Relay/Server may generate a delivery report if a delivery report has been requested by the originator MMS User Agent

- upon failure of routing forward the MM.

The recipient MMS Relay/Server shall generate a delivery report if a delivery report has been requested by the originator MMS User Agent and if the recipient MMS User Agent did not request a delivery report not to be generated or in any case that a VASP has requested a delivery report

- upon receipt of a response to a notification, in case the MM is rejected by the recipient MMS User Agent;
- upon receipt of a forwarding request, in case the MM is forwarded by the recipient MMS User Agent to other MM recipient(s), without prior retrieval;
- upon receipt of a response to an MM's delivery, in case the MM is retrieved by the MM recipient;
- upon receipt of a request for deletion of an MM (i.e., an MM for that retrieval has been deferred).
- upon expiry of the MM, in case the MM is not rejected and not retrieved by the MM recipient before the expiry.

The originator MMS User Agent or VASP, i.e. the MMS User Agent or VASP receiving the delivery report, may match the delivery report to the sent MM by retaining the message identification of the sent MM and comparing it to the received delivery report, which shall contain the message identification of the original MM. In case of multiple MM recipients, it is necessary for the originator MMS User Agent or VASP to retain the MM recipient addresses as well, to match the delivery report to the sent MM.

If a delivery report has been requested by the originator MMS User Agent and if the recipient MMS User Agent did not request a delivery report not to be generated, or in any case that the request for the delivery report comes from a VASP, the recipient MMS Relay/Server

- shall generate the delivery report;
- shall deliver the delivery report to the originator MMS Relay/Server;
- shall store delivery reports in the network until the originator MMS Relay/Server becomes reachable or until the delivery report expires.

In addition to the above, and as depicted in Annex M, if an agreement exists between the MMS Relay/Servers, the originator MMS Relay/Server may request a delivery report regardless of whether the originator MMS User Agent requested the delivery report. Then, if the originator MMS Relay/Server requests a delivery report, the recipient MMS Relay/Server shall generate a delivery report for each MM received for that specific originator MMS Relay/Server.

In the event where both the originator MMS User Agent and the originator MMS Relay/Server request a delivery report, and the recipient refuses to have a report generated:

- if the originator MMS Relay/Server requested a delivery report; the recipient MMS Relay/Server shall produce and provide it to the originator MMS Relay/Server (which shall not forward to the requesting originator MMS User Agent);
- if the originator MMS Relay/Server did not request a delivery report; the recipient MMS Relay/Server shall not produce a delivery report.

Within the delivery report the recipient MMS Relay/Server

- shall provide the MM originator address to the originator MMS Relay/Server;

- shall provide the MM recipient address to the originator MMS Relay/Server;
- shall provide the identification of the original MM for which the delivery report has been generated to the originator MMS Relay/Server;
- shall provide status information how the MM was handled/delivered (e.g. expired, rejected, delivered, forwarded or indeterminate) to the originator MMS Relay/Server;
- may provide further qualification about the status information how the MM was handled/delivered to the originator MMS Relay/Server for displaying the same to the originator;
- shall provide a time stamp when the MM was handled to the originator MMS Relay/Server.

For each MM recipient of the original MM for which the delivery report has been generated and becomes available at the originator MMS Relay/Server, the originator MMS Relay/Server

- shall deliver the delivery report to the originator MMS User Agent (i.e. the recipient MMS User Agent of the delivery report) or VASP, when requested by the originator MMS User Agent and not refused by the recipient.

Within the delivery report the originator MMS Relay/Server

- shall provide the MM recipient's address to the originator MMS User Agent (the recipient MMS User Agent of the delivery report) or VASP;
- shall provide the identification of the original MM for which the delivery report has been generated to the originator MMS User Agent (the recipient MMS User Agent of the delivery report) or VASP;
- shall store delivery reports until the originator MMS User Agent becomes reachable (e.g. user moves back into coverage, switches MMS User Agent on) or until the delivery report expires;
- should store delivery reports until the VASP becomes reachable (e.g. in case of transport failure towards the VASP) or until the delivery report expires.

7.1.6 Read-Reply Report

The MMS Relay/Server shall support the read-reply reporting service. Read-reply reports shall only be generated for MMs.

Upon MM submission the originator MMS User Agent or VASP may be able to request a read-reply report for a specific MM.

Upon MM retrieval the recipient MMS User Agent may receive an indication that a read-reply report is requested for the MM.

After having handled/rendered the MM the recipient MMS User Agent may generate a read-reply report if requested by the originator (MMS User Agent or VASP) and if the originator address (MMS User Agent or VASP address) is available. In case of transporting of application data acc. to clause 7.1.18 the recipient MMS User Agent shall not generate a read-reply report unless it has successfully delivered the MM related information to the application addressed by the destination application identifier.

The originator MMS User Agent or VASP, i.e. the MMS User Agent or VASP receiving the read-reply report, may match the read-reply report to the sent MM by retaining the message identification of the sent MM and comparing it to the received read-reply report, which shall contain the message identification of the original MM. In case of multiple MM recipients, it is necessary for the originator MMS User Agent or VASP to retain the MM recipient addresses as well as to match the read-reply report to the sent MM.

If a read-reply report has been requested by the originator MMS User Agent or VASP and if the recipient MMS User Agent supports the read-reply feature and if the recipient allows its creation the recipient MMS User Agent shall submit the read-reply report to the recipient MMS Relay/Server at the earliest opportunity.

NOTE: Since the MM recipient has the right to deny this service not receiving a read-reply report does not mean the message has not been rendered / handled by the recipient MMS User Agent.

A read-reply report:

- shall contain the MM originator's address
- shall contain the MM recipient's address
- shall contain the message identification of the original MM for which the read-reply report has been generated.
- shall provide status information how the MM was rendered (e.g. read, deleted without being read)
- shall provide a time stamp for when the MM was rendered

The recipient MMS User Agent shall store read-reply reports in the UE until the recipient MMS Relay/Server becomes reachable (subject to support of the read-reply reporting service by the recipient MMS User Agent and storage place being available).

Upon reception of a read-reply report from a recipient MMS User Agent the recipient MMS Relay/Server

- may provide a time stamp for the read-reply report, i.e. it may also override the MMS User Agent's time stamp,
- shall pass the MM originator address unaltered when routing the read-reply report towards the originator MMS User Agent or originator VASP (i.e. the recipient MMS User Agent or recipient VASP of the read reply report)
- shall insert the MM recipient's address into the read-reply report if not yet provided
- may override the recipient's address provided by the recipient MMS User Agent in the read-reply report (subject to MMS service provider's preferences)
- shall resolve the MM originator's address,
- shall route the read-reply report towards the originator MMS User Agent or originator VASP of the original MM.

A special case is where the recipient MMS Relay/Server is also the originator MMS Relay/Server. In this case the MM does not have to be routed forward.

7.1.7 Support for Streaming in MMS

This section defines the service behaviour specific to support for streaming in MMS. The term "According to the normal MMS framework.." indicates those paragraphs which are not specific to streaming but described elsewhere in subclause 7.

MMS supports streaming for the retrieval of MM contents (one or more MM elements). Support for streaming is optional for both the MMS User Agent and the MMS Relay/Server.

The use of streaming for the retrieval of MM contents is independent of the MM submission. The retrieval of MM contents to the recipient MMS User Agent depends on the configuration and the capability of the recipient MMS User Agent and the recipient MMS Relay/Server. MM contents may be either delivered as non-streaming MM elements, or made available for streaming retrieval. The recipient MMS Relay/Server decides whether to use streaming based on the media type and the media format of the subjected MM contents, capability negotiation and/or user settings/preferences. The recipient MMS Relay/Server may convert media types and/or formats of MM contents to make it available for streaming retrieval. If streaming retrieval is used, the streaming-specific protocols, codecs, presentation, session negotiation and control are according to [40] and [41].

According to the normal MMS framework, the recipient MMS Relay/Server shall generate a notification which contains information to enable the recipient MMS User Agent to request for the retrieval of the corresponding MM from the recipient MMS Relay/Server.

Upon retrieve request, the recipient MMS Relay/Server shall deliver a modified MM with one or several presentation descriptions as defined in [41], as one or several MM elements, in place of the corresponding streamable MM contents to the recipient MMS User Agent, if it has made the MM contents available for streaming retrieval. The format of the presentation description is as defined in [41]. MIME type of the format of the presentation description shall be used to indicate the content type of the MM elements, which contain the corresponding presentation description. The presentation description carries all required information to initiate the streaming process by the recipient MMS User Agent in order to retrieve the streamable MM content from the media server as defined in [40]. Example of a presentation description is shown in Annex J.

According to the normal MMS framework, the recipient MMS Relay/server shall base the generation of a delivery report on the receipt of a response to the delivery of the modified MM from the recipient MMS User Agent.

After the successful reception of the MM, which includes the presentation description, the recipient MMS User Agent may initiate a streaming process to retrieve the streamable MM contents depending on the information in the presentation description. According to the normal MMS framework, the recipient MMS User Agent may base the generation of a read-reply report either on the rendering/handling of the modified MM, or on the rendering/handling of the streamable MM contents.

Annex J further depicts the streaming transactions after the decision to offer streamable content is made by the recipient MMS Relay/Server.

7.1.8 Support for Prepaid Service in MMS

An MMS Relay/Server may support the prepaid concept. A prepaid customer may be charged for submitting or retrieving MMs/abstract messages.

In the submission case the originator MMS Relay/Server may first ascertain that the originator of the MM/abstract message is a prepaid customer. The MMS Relay/Server may then initiate a credit check and further processing of the MM/abstract message is put on hold. In the case the customers credit is insufficient for submitting this particular MM/abstract message the originator MMS Relay/Server may reject it. The check may be based on several criteria like:

- size of the MM
- content type
- settings of information elements
- type of the abstract message

In case an MM/abstract message can not be accepted, the originator MMS Relay/Server shall respond with an appropriate status value to the submit request. The MMS User Agent should bring this information to the user's attention.

In case an MM/abstract message is accepted it is further processed by the MMS Relay/Server.

In the retrieving case the recipient MMS Relay/Server may first ascertain that the recipient of the MM/abstract message is a prepaid customer. The MMS Relay/Server may then initiate a credit check for the particular customer. The check may be performed at the time the MM/abstract message arrives at the recipient MMS Relay/Server. Based on the result the MMS Relay/Server may reject or accept the MM/abstract message. If the MM/abstract message was accepted (with or without previous check) the MMS Relay/Server may perform a credit check at the time the MMS User Agent sends a retrieve request. The check may be based on several criteria as in the sending case.

In case an MM/abstract message can not be retrieved because the customers account balance is too low, the recipient MMS Relay/Server may respond with an appropriate status value to the retrieve request. The MMS User Agent should bring this information to the user's attention.

Otherwise the MM/abstract message is delivered to the MMS User Agent.

7.1.9 Address Hiding in MMS

An originator MMS User Agent may support a request for the sender's address to be hidden from the recipient(s). An MMSE may support such a request, i.e., it may allow address hiding. In any case, a recipient MMSE shall ensure that a sender's address is hidden from the recipient MMS User Agent when address hiding is requested for an MM.

If the originator's MMS Relay/Server does not allow address hiding (anonymous messages) (e.g. legislation does not permit anonymous messages) a message containing a request for address hiding shall be rejected upon submission and the originator's MMS Relay/Server shall return an error information to the originator MMS User Agent.

In the case of originator's MMS Relay/Server rejects the message because it does not allow address hiding the rejection information shall be delivered in a submit response together with optional status text.

In case the recipient MMS Relay/Server rejects the message because it does not allow address hiding and the originator MMS User Agent has requested a delivery report, then the recipient MMS Relay/Server, via the originator MMS Relay/Server, shall inform the originator of the message rejection within the delivery report.

In case the recipient MMS Relay/Server rejects the message because it does not allow address hiding and the originator MMS User Agent has not requested a delivery report, then the originator MMS Relay/Server may inform the MM originator by generating a new MM which is sent back to the MM originator.

Independent of whether or not the originator's address is shown or hidden to the recipient, the originator may be able to ask for a delivery report to an MM and also receive the delivery report according to the normal behaviour of the MMS framework.

If the originator MMS User Agent has requested both its address to be hidden and a read-reply report the originator MMS User Agent might not receive the read-reply report.

If the recipient forwards the MM outside the MMSE and the peer entity is unknown to the forwarding MMS Relay/Server the recipient MMS Relay/Server shall not transfer the originator's address but replace it with either appropriate coded address or leave the originator address field blank.

In case of forwarding an MM without prior retrieval the forwarding MMS User Agent shall not request her address to be hidden.

If the originator MMS User Agent has requested its address to be hidden and MM is targeted to the VASP/VAS, MMS Relay/Server shall send originator address to the VASP/VAS but not the request of address hiding. If the originator has requested address hiding the originator MMS Relay/Server may replace the originator address with an appropriate coded address, leave the originator address empty, or send the originator address unaltered to the VASP. If the VASP/VAS targeted is not allowed to receive originator address information, e.g. due to privacy issues, the MMS Relay/Server may replace the originator address with an appropriate coded address or leave the originator address empty.

7.1.10 Support for Reply-Charging in MMS

The MMS User Agent may support reply-charging. If the MMS User Agent supports this feature the MMS User Agent shall support the following behaviour.

The MMS Relay/Server may support reply-charging. If the MMS Relay/Server supports this feature the MMS Relay/Server shall support the following behaviour.

The VASP connected to an MMS Relay/Server over MM7 may support reply-charging. If the VASP supports this feature the VASP shall support the following behaviour.

A User of the MMS (the originator MMS User Agent or VASP) may be able to take over the charge for the sending of a reply-MM to their submitted MM from the recipient(s). In case of forwarding, the forwarding MMS User Agent may be able to take over the charge for the sending of a reply-MM to their forwarding MM from the recipient(s), in this case, forwarding MMS User Agent takes the role of originator MMS User Agent. Therefore the originator of an MM (either MMS User Agent, forwarding MMS User Agent or VASP) should be able to mark the MM as reply-charged. The originator's MMS Relay/Server could either accept the user's or VASP's settings for reply-charging or not and should be able to convey feedback to the originator. It should be possible to take over the charge for reply-MMs from different recipients.

The recipient should be notified if she is not charged for a reply-MM to this particular MM. However, the indication of reply-charging covers only the willingness/fact that a reply-MM to an original MM is free of charge, not that the retrieval of the original MM marked as reply-charged is free of charge. Both the originator and the recipient MMS Relay/Server shall be able to control that not more than one reply-MM per recipient is charged to the originator. The MMS User Agent may indicate to the user if an MM has already been replied to.

The request for reply-charging shall not be passed on to the recipient

- if the recipient is not known to belong to an MMSE peer entity, or
- in the case the MM is forwarded.

NOTE: For this release the following limitations apply: Support for reply-charging in MMS is restricted to MMS User Agents and VASPs belonging to the same MMSE, i.e. originator and recipient MMSE are identical. Reply-charging allows only one reply-MM per recipient, i.e. reply-charging applies to the first successful submission of an MM sent as a reply. Furthermore, a reply-MM is restricted to text only. These limitations may be elaborated further in future releases.

In addition to the service behaviour described in previous clauses the following behaviour is expected to support reply-charging in MMS.

Within the submission of an MM the MM originator (either MMS User Agent or VASP) may indicate a willingness to pay the charge for one reply-MM per MM recipient. In this case the originator MMS User Agent or originator VASP:

- shall indicate the sender's willingness to pay the charge for one reply-MM per MM recipient,
- may define a reply-charging limitation request (e.g. may specify the latest time of submission of the reply-MMs or a maximum size of reply-MMs).

In a response to the MM submission the originator MMS Relay/Server shall inform the MM originator (either MMS User Agent or VASP) whether or not it accepts

- the originator's request for reply-charging in the original MM,
- the reply-charging limitations set by the originator (either MMS User Agent or VASP) in the original MM.

Upon reception of an MM from an originator (either MMS User Agent or VASP) the originator MMS Relay/Server

- may provide reply-charging limitations, i.e. it may also override by further limiting the MMS User Agent's or VASP's settings for reply-charging limitations,
- shall pass the indication whether or not a reply-MM is requested unaltered when routing the original MM towards the MM recipient(s) if the peer entity is known to be the same MMS Relay/Server,
- shall pass the reply-charging limitations for the reply-MM when routing the original MM towards the MM recipient(s) if the peer entity is known to be the same MMS Relay/Server.

If the MM recipient has requested the original MM to be forwarded to some other address the recipient MMS Relay/Server

- shall not pass any information set by the originator about the reply-charging request towards the addressee(s) of the forwarding request.

If the MM recipient has requested the original MM to be forwarded to some other address, forwarding MMS User Agent may indicate a willingness of forwarding MMS User Agent to pay the charge for one reply-MM per MM recipient. In this case the forwarding MMS User Agent

- shall indicate the forwarding user's willingness to pay the charge for one reply-MM per MM recipient;
- may define a reply-charging limitation request (e.g. may specify the latest time of submission of the reply-MMs or a maximum size of reply-MMs).

If reply-charging has been requested by the MM originator (either MMS User Agent or VASP) the recipient MMS Relay/Server

- should inform the recipient MMS User Agent with the MM notification and upon MM delivery that the MM originator is willing to pay for a reply-MM to this original MM.
- may notify the recipient about the reply-charging limitations set by the orginator (e.g. the latest time of submission of a reply-MM to the original MM).

When a user intends to send a reply-MM to the MM originator (to the originator MMS User Agent or to the VASP) the recipient MMS User Agent (which is the originator MMS User Agent of the reply-MM):

- shall mark the MM as a reply-MM,
- shall provide the message ID of the original MM which it replies to (if it is the reply-MM),
- shall submit the reply-MM to the recipient MMS Relay/Server,
- may be able to indicate to the user whether this MM has already been replied to,
- may be able to indicate to the user if the reply-charging limitations can not be met.

Upon submission the recipient MMS Relay/Server

- shall reject the reply-MM submission attempt and should convey this information back to the recipient MMS User Agent (which is the originator MMS User Agent of the reply-MM) if the reply-MM submission attempt does not meet the limitations set by the originator (either MMS User Agent or VASP),
- shall be able to uniquely map the reply-MM to the original MM.

7.1.11 MM4 forward routing failure

If the interworking between two MMS Relay/Servers fails and a MM can not be routed forward across MM4, the originator MMS UA should be notified. If the MMS UA is notified the procedures described in this section shall be followed.

In case the originator MMS UA has requested a delivery report to a MM that failed to be routed forward across MM4, the originator MMS Relay/Server shall generate and send a delivery report that informs the originator MMS UA about the error.

In case the originator MMS UA has not requested a delivery report to a MM that failed to be routed forward across MM4, the originator MMS Relay/Server may generate and send a MM that informs the originator MMS UA about the error.

7.1.12 Support for Persistent Network-based Storage

An MMS User Agent and an MMS Relay/Server may support persistent network-based storage functions. The following descriptions apply when MMBoxes are supported.

For MMS Relay/Servers that support MMBoxes, the following additional functions are defined:

- Upon submission, cause the MM to also be stored persistently, if configured or requested;
- Upon arrival, cause the incoming MM to be stored persistently, if configured;
- Cause the MM referenced in a notification to be stored persistently;
- Cause a copy of a forwarded MM to be stored persistently;
- Upload and store an MM into the user's MMBox;
- Forward an MM from the MMBox to one or more recipients;
- Delete one or more MMs;
- View a list of MMs within the MMBox and their associated information elements;
- Update MM state and/or flags;
- Retrieve an MM from the user's MMBox.

7.1.12.1 MM State and MM Flags

The MMS Relay/Server shall support both MM State and MM Flags. The MMS User Agent may support MM State or MM Flags, or both.

While persistently stored, each MM has an MM State, representing the condition under which the MM is stored. The states are: Draft, Sent, New, Retrieved, and Forwarded. These states are mutually exclusive. The MMS Relay/Server shall set the following specific values for the MM State, unless otherwise specified by the MMS User Agent:

- The Draft state shall be set when an MM is uploaded and stored;
- The Sent state shall be set when an MM is also stored as part of a submission;
- The New state shall be set when an incoming MM is stored as part of being received by the MMS Relay/Server;
- The Retrieved state shall be set upon retrieval of an MM;
- The Forwarded state shall be set whenever an MM is forwarded.

In addition to state, MMs may be flagged with keyword values, which shall be set by the MMS User Agent. The flags may be used to perform selections on the MMBox, offering more precise control over which MMs are to be returned on a view request.

7.1.12.2 Requests to Store MMs within an MMBox

The MMS Relay/Server shall store an MM into an MMBox under the following conditions:

- Arrival of an MM, prior to notification, if configured and enabled for the recipient's MMBox;
- Store request by an MMS User Agent, based on a Message Reference received in a notification;
- MMS User Agent submitting an MM, which also includes a store request;
- MMS User Agent forwarding an MM, which also includes a store request;
- MMS User Agent uploading an MM for storage into the MMBox;

The MMS Relay/Server shall provide the Message Reference from the newly stored MM to the MMS User Agent.

7.1.12.3 Requests to Retrieve MMBox Content

The MMS Relay/Server shall support the following operations on the MMs within an MMBox, or on the MMBox itself:

- Retrieve an MM;
- Forward an MM;
- Store (update) state and flags on an MM;
- View information elements within selected MMs;

The Store and View operations shall return a Message Reference to selected MMs, in addition to their other functions.

7.1.12.4 MM Deletions

MMs stored within an MMBox shall be retained until:

- Automatic deletion occurs because the time of expiry was exceeded;
- The MMS User Agent issues a request to delete an MM based on a Message Reference obtained from an MMBox operation.

7.1.12.5 MMBox Service Constraints

MMS Relay/Servers supporting MMBoxes should not store the same MM twice within an MMBox.

NOTE: If the operator has configured automatic MMBox storage for incoming MMs, and the MMS User Agent issues a request to store an MM within the MMBox for a newly arrived MM, the MMS Relay/Server should store the newly arrived MM only once.

MMS Relay/Servers that support MMBoxes shall not generate multiple delivery reports of the same MM status value for MMs stored within the MMBox.

MMS User Agents that support MMBoxes shall not generate multiple read-reply reports for MMs stored within an MMBox.

7.1.13 Support for Value Added Services (VAS) in MMS

The MMS Relay/Server may support services, in addition to user-to-user messaging, that are either provided by the MMS operator or by third-party Value Added Service Providers (VASP). Examples of services that may be provided as:

- Messages that originate from the VASP to a single or mass-distribution of recipients;
- Messages that originate from a MMS Relay/Server to the VASP that may generate a VASP reply or a new MM submission.

NOTE: MMS Relay/Server may receive multimedia message from MM1, MM3, MM4 or MM7 Reference points before routing forward message to the VASP. Messages originated from the VASP may be targeted to the recipient via MM1, MM3, MM4 or MM7 Reference points. In a case of the recipient or the originator is outside a single MMSE (outside MMSE to which VASP is connected) special functionalities are not specified in this release (e.g. the recipient MMS User Agent may deny generating Delivery report). Future releases may expand this support across multiple MMSEs.

7.1.13.1 Authentication

MM7 should use transport layer security mechanisms to authenticate the VASP in this release.

For example, if HTTP is used as an MM7 transport, many optional authentication mechanisms are available. The MMS Relay/Server or the VASP may use the mechanisms defined in [65]," basic" and "digest" authentication to authenticate the VASP during each session established for message submission. Each VASP may send a VASP ID and a password before any transactions will be allowed by the MMS Relay/Server. For additional security, HTTP may be carried over a TLS [66] session to the MM7 interface.

Alternatively, authentication mechanisms based on public/private key cryptography and certificates may also be used. Key management is out of scope for this release.

The VASP may authenticate the MMS Relay/Server using similar mechanisms. The exact nature of these authentication procedures is not dictated by this document, however the MMS Relay/Server may supply its identification as part of the request information.

7.1.13.2 Authorisation

The MMS Relay/Server should authorise the VAS to send MM to the MMS UA. The authorisation shall be completed during each session established by the VAS. For example, if the VAS attempts to send a MM to the MMS Relay/Server when the VAS is not authorized, then the MMS Relay/Server should not permit the operation .

7.1.13.3 Confidentiality

The interface between MMS Relay/server and VASP may be carried over an encrypted and secure bearer, e.g. HTTP over SSL or TLS, or by use of application-layer encryption. This is an optional feature and may be further elaborated in future releases.

7.1.13.4 Charging Information

VASP may provide service codes that contain billing information that may be transferred to the MMS Relay/Server and passed directly to the billing system without intervention.

If a commercial agreement between the VASP and the recipient exists, the VASP may provide an indication to the MMS Relay/Server which party is expected to be charged for an MM submitted by the VASP, e.g. the sending, receiving, both parties or neither.

NOTE: Warning. Allowing a VASP to indicate which party is expected to be charged may lead to abuse. How to protect against this abuse is not in the scope of this specification.

If a commercial agreement between the MMSE to which the VASP is connected and a third party exists, a VASP may provide an indication to the MMS Relay/Server that this third party is expected to be charged for services which this VASP provides to any other user(s) on behalf of this third party.

NOTE: Warning. Usage of third party charging may lead to abuse. How to protect against this abuse is not in the scope of this specification.

7.1.13.5 Message Distribution Indicator

A Message Distribution Indicator may be provided for the whole Multimedia Message coming from a VASP. The indicator is purely informational, e.g. an MMS User Agent is not responsible for any functionality regarding message redistribution. The aim is to indicate that the MM content is not to be redistributed.

NOTE: DRM-protection of an MM, as specified in section 7.1.15, takes precedence over Message Distribution Indicator from REL-6 onwards.

7.1.13.6 Identification of applications that reside on MMS VAS Applications

Applications that reside on a MMS VAS Application (see section 7.1.18) may trigger a VAS to submit or receive abstract messages over the MM7 reference point. These applications shall be identified in the abstract messages separately from the identification of the VASP and VAS. The identification of the VASP and VAS should not be affected by the addition of these new application identification fields. It is the responsibility of the VASP and VAS to maintain the connection of the identification to the applications that reside on the MMS VAS Application, and, as such, is out-of-scope for the present document.

7.1.14 Handling of MMS-related information on the (U)SIM

NOTE : This section does not apply when the MMS-UA is implemented within equipment which does not support a (U)SIM.

An MMS User Agent shall use the MMS related information stored in the (U)SIM [67] or SIM [75], if present, according to the definitions in this subclause 7.1.14 - unless otherwise specified by the user. This information comprises:

- MMS connectivity information, as defined in Annex F. This information is used to connect to the network for the purpose of accessing the MMS Relay/Server,
- MMS user preferences, as defined in Annex F, and
- MMS notifications.

MMS connectivity information, on the (U)SIM includes a number of sets of MMS connectivity parameters. Some of these sets of MMS connectivity parameters are preset by the issuer of the (U)SIM with the first set being the default. Such default preset MMS connectivity parameter set shall be selected unless otherwise specified by the user.

The MMS connectivity information on the (U)SIM includes preferences for the selection of Interface to Core Network and Bearer parameters (cf. Annex F) as defined in [67] or [75]. If these are stored on the (U)SIM the MMS-capable UE shall automatically select the Interface to Core Network and Bearer parameters based on their order of precedence defined on the (U)SIM unless otherwise specified by the user.

MMS user preferences information, which is stored on the (U)SIM, shall be used by an MMS User Agent for user assistance in preparation of terminal-originated MMs (e.g. default values for parameters that are often used).

MMS notifications, should be stored on the (U)SIM together with an associated status by a recipient MMS User Agent:

- When an MMS User Agent has deleted a notification which was stored on the (U)SIM, the associated status shall be set to “Free space”
- When an MMS User Agent stores a notification on the (U)SIM, the associated status shall be set to “Used space”

- When a recipient MMS User Agent has not handled the notification which is stored on the (U)SIM (e.g. the details of the notification were not shown to the user), the associated status shall be set to "notification not read",
- When a recipient MMS User Agent has handled the notification which is stored on the (U)SIM (e.g. the details of the notification have been shown to the user), the associated status shall be set to "notification read",
- When a recipient MMS User Agent has not retrieved an MM based on the notification which is stored on the (U)SIM, the associated status shall be set to "MM not retrieved" – unless the recipient MMS User Agent has rejected or forwarded the MM,
- When a recipient MMS User Agent has retrieved an MM based on the notification which is stored on the (U)SIM, the notification shall be either deleted or the associated status shall be set to "MM retrieved",
- When a recipient MMS User Agent has rejected an MM based on the notification which is stored on the (U)SIM, the notification shall either be deleted or the associated status shall be set to "MM rejected",
- When a recipient MMS User Agent has forwarded an MM based on the notification which is stored on the (U)SIM, the notification shall either be deleted or the associated status shall be set to "MM forwarded",

Upon an attempt to store a notification on a (U)SIM, an MMS User Agent should ensure that the notification is not lost unless the (U)SIM acknowledges the storage attempt to be successful.

7.1.14.1 Handling of MMS-related transfer to the USIM

When an MMS notification is addressed to the USIM, then:

- the application identifier functionality as defined in 7.1.18.2.2 applies.
- the application identifier syntax as defined in 3GPP TS 31.111 [87] shall be used.

the ENVELOPE mechanisms for transferring the MMS notification to the USIM defined in 3GPP TS 31.111 [87] shall be used.

7.1.15 Support for Digital Rights Management in MMS

The support of DRM in MMS shall conform to the OMA DRM specifications [76], [77] and [78].

DRM-protection of an MM shall take precedence over Message Distribution Indication and over MM7 Content Adaptation Restriction from REL-6 onwards.

The following sections describe the application of DRM protection to MMS.

7.1.15.1 DRM-protected content within an MM

An MM may include one or more DRM-protected MM elements. DRM protection of MM elements shall be performed according to [76], [77] and [78], with each MM element being protected separately. Each DRM-protected MM element shall be encapsulated as a DRM object, i.e. 'DRM Message' or 'DCF'.

In particular, DRM protection shall neither be applied to an MM as a whole (MMS PDU), nor to any presentation description (e.g. SMIL) within an MM.

The headers (i.e. content-location or content-ID) used by the presentation description (e.g. SMIL) to refer to a DRM object shall be placed as MMS body part headers, due to MIME-based structure of the MM.

In case of Separate Delivery, the 'X-Oma-Drm-Separate-Delivery' header, if present, shall be placed as MMS body part header, due to MIME-based structure of the MM.

MMS body part headers shall not be DRM-protected.

7.1.15.2 DRM-related User Agent beaviour

An MMS User Agent may support Digital Rights Management, DRM according to [76], [77], [78]. An MMS User Agent that supports the DRM restrictions shall indicate this support in its terminal capability profile, as defined in the DRM specifications.

NOTE: E.g. after having received an MM containing a 'DRM Message' object, an MMS User Agent does neither use that DRM-protected MM element while composing a new MM nor store it into a user accessible persistent network storage (e.g. MMBox).

7.1.15.3 DRM-related Relay/Server behaviour

An MMS Relay/Server shall support Forward Lock, Combined Delivery and Separate Delivery DRM functionalities according to [76], [77], [78].

7.1.15.3.1 Support for Forward Lock and Combined Delivery

For Forward Lock and Combined Delivery support, the MMS Relay/Server shall ensure that no single DRM-protected MM element is conveyed to any receiving entity, such as an MMS User Agent, an MMS Relay/Server, a user-accessible persistent network-storage (e.g. MMBox), which does not comply with OMA DRM specifications [76], [77].

In particular, the MMS Relay/Server shall not:

- deliver any DRM-protected MM elements ('DRM Message') to an MMS User Agent which does not support DRM;
- route forward any DRM-protected MM elements ('DRM Message') over MM3, MM4 or MM7 to a receiving entity which does not support DRM;
- store any DRM-protected MM elements ('DRM Message') into a user accessible persistent network storage (e.g. MMBox);
- forward any DRM-protected MM elements ('DRM Message') prior to MM retrieval or from the MMBox.

The MMS Relay/Server shall not alter or strip-off any part of the 'DRM Message' header (e.g. the Boundary parameter declaration).

7.1.15.3.2 Support for Separate Delivery

If the recipient MMS User Agent supports DRM Separate Delivery the MMS Relay/Server shall relay any DCF object unaltered. In particular it shall not strip-off any part of the DCF body or headers (e.g. the 'X-Oma-Drm-Separate-Delivery' header).

The MMS Relay/Server shall accept separate delivery protected content on all interfaces.

If the recipient MMS User Agent does not support separate delivery the MMS Relay server shall either:

- Replace all non supported DRM protected elements by a descriptive error text and/or a placeholder and send the modified MM to the recipient MMS User Agent, or
- Not deliver the whole MM to the MMS User Agent.

7.1.16 Support of Hyperlinks in MMS

An MMS User Agent should support hyperlinks within an MM as described below:

NOTE: There is no requirement on the MMS User Agent for supporting any specific transport protocols for following URLs conveyed in hyperlinks.

If a hyperlink is embedded in a SMIL presentation it shall be according to PSS SMIL [74].

If the MMS User Agent supports Rich Text Encoding in XHTML Mobile Profile [74] the hyperlink may also be embedded according to XHTML Mobile Profile [74].

An MMS User Agent should ask for end-user confirmation before following a hyperlink which triggers a terminal action (e.g. placing a phone call) or which refers to a resource that is not part of the same MM.

NOTE: End user confirmation is recommended as accessing a resource on the network might result in additional charges.

7.1.17 Support of Messaging Service Control Function

The MMS Relay/Server may support interworking with a MSCF, which allows the operator to handle advanced addressing within the MMSE.

Whether the MMS Relay/Server shall interact depends on the following trigger configuration data in the MMSE:

- User specific trigger, i.e. the interaction with the MSCF is invoked if the user is provisioned with the relevant trigger information.
- Address specific trigger, i.e. the interaction with the MSCF is invoked, if the recipient address is configured in the MMS Relay/Server with a MSCF trigger profile.

7.1.17.1 Triggering of interactions with the MSCF

The MMS Relay/Server shall support procedures for the interaction with the MSCF together with the following MMS services:

- at the time of MM submission via the MM1 interface
- at the time of submission via the MM7 interface
- prior to the MM notification via the MM1 interface.

Whether the interaction with the MSCF is invoked depends on the provisioning of the following triggers definitions in the MMS Relay/Server:

Users profile based Trigger:

The sending user is provisioned with a trigger information for the invocation of the interaction with the MSCF function.

Note, the provisioned user may be an MMS subscriber or a VASP.

Address based Trigger:

The MMS Relay/Server keeps a trigger criterion for the recipient address provided in a submit request.

The table below defines the applicability of trigger definitions to MMS services:

Table 1: Applicability of Trigger Definitions to MMS services

Trigger MMS Service	User profile specific	Address specific
MM1 submission	YES	YES
MM7 submission	YES	YES
MM1 notification	YES	NO

7.1.17.2 User Profile Trigger criteria

If the Relay/Server supports the interworking with MSCF it shall be possible to provision trigger definitions in the MMS user profile. Any MMS subscriber can be provided with a maximum of two trigger definitions. A VASP can be provided with the Submit trigger definition only. A user profile trigger definition shall provide at least the attributes defined in the table below:

Table 2: User Profile to support Messaging Service Control Function

Parameter	Value	Description
Trigger Point	Submit / Delivery	Specifies the MMS service for which the MM10 interworking process shall be invoked. Each entry shall contain one trigger definition. For a VASP only the Submit value is applicable.
MSCF Address	Host and Realm indication of the MSCF	Address information to route the MM10 interrogation request to the MSCF.
Application identification	String defined by the operator	Identification of the application on the MSCF.
Recovery handling	Continue / Reject	Specifies the MMS Relay/Server process handling if the interrogation to the MSCF fails abnormally.

7.1.17.3 Address based Trigger criteria

The MMS Relay/Server may keep a list of recipient addresses for which interworking with the MSCF is required. The address criteria may be managed independently for MM1 submission and MM7 submission. For MM7 submission criteria definition per VASP may be supported in addition.

For each of the recipient address criteria at least the following trigger definition shall be supported.

Table 3: User Profile to support Messaging Service Control Function

Parameter	Value	Description
Address Criterion	Address string	Specifies the recipient address in a submit request that shall lead to invocation of an MM10 interworking process. Address string may be a RFC2822 address, a PLMN address or any other address (alphanumeric short code etc.). Note, address string may contain wildcards to allow address range definitions.
MSCF Address	Host and Realm indication of the MSCF	Address information to route the MM10 interrogation request to the physical MSCF.
Application identification	String defined by the operator	Identification of the application on the MSCF.
Recovery handling	Continue / Reject	Specifies the MMS Relay/Server process handling if the interrogation to the MSCF fails abnormally.

7.1.17.4 Charging impact

The MSCF shall be able to influence the content of the CDR created at the MMS Relay/Server. The data provided to the MMS Relay/Server is transparent for the MMS Relay/Server and will be transferred to the post processing or real-time charging services.

The MSCF is able to modify the recipient routeing addresses. CDRs generated by the MMS Relay/Server shall contain the recipient addresses originally requested by the MMS User Agent and the routeing recipient addresses requested by the MSCF.

The MSCF shall be able to request an original MM to be sent to a number of alternative recipients (copy/forward). The MMS Relay/Server copies/forwards the MM as requested by the MSCF. In this case the MMS Relay/Server shall create CDRs for all result recipient addresses as requested by the MSCF.

7.1.17.5 Message handling

The handling of following MMS services may result in triggering the MSCF :

- MM1 Submission
- MM1 Delivery
- MM7 Submission

This section defines the message handling procedures in the MMS Relay/Server if interworking with an MSCF is supported. The message handling process shall follow the order as defined by the description below.

7.1.17.5.1 MM1 Submission

7.1.17.5.1.1 User Profile based trigger

7.1.17.5.1.1.1 Interrogation Request

For any MM1 submitted message the MMS Relay/Server shall query the sender's user profile entry for a profile specific trigger as defined in section 7.1.17.2. If an profile specific trigger for submission is in place, the MMS Relay/Server shall suspend message processing and send the MM10 interrogation request as defined in section 8.9 to the MSCF.

The following principles for the composition and processing of the MM10 interrogation request shall apply:

The MMS Relay/Server shall provide as the served user identity the sender's key identification as derived from the user's profile (e.g. the MSISDN).

In the Sender address parameter the MMS Relay/Server may provide the sender identification intended for presentation purposes. This identification may be the sender address as provided by the user agent.

The MM10 interrogation request shall contain the list of all recipient addresses provided by the user in the submitted message. For each of the recipient addresses a qualification of the used address field (To, CC, BCC) shall be given.

The sender may request multiple recipients for one message. If the MM10 interrogation request is triggered due to a user profile based trigger then all recipient addresses shall be provided to the MSCF. The MMS Relay/Server shall provide an unique reference (sequence number) for each of the recipient addresses. This reference shall allow the MMS Relay/Server to track the modification of the original address after processing in the MSCF.

7.1.17.5.1.1.2 Interrogation Response

The MSCF shall respond to the MM10 interrogation request with an MM10 interrogation response as defined in section 8.9.

The MSCF may return for each specific recipient addresses a result. The result shall provide a reference to the initial recipient address of the MM10 interrogation request by means of the unique reference (sequence number). If the MSCF requests additional recipient addresses in the response (e.g. forwarding addresses), then it shall allocate new reference numbers. The MSCF shall continue to use reference number values greater then the highest value provided by the MMS Relay/Server.

Each result recipient address may consist of several components.

Routeing Address

If the result recipient address contains a Routeing Address then the MMS Relay/Server shall continue handling of the MM as follows:

- The Routeing Address may contain recipient addresses in all formats that are specified for the MM1 interface. In this case the MMS Relay/Server shall continue handling of the recipient according to the definitions of this specification for the MM1 interface.

  A Routeing Address provided in this format may be subject to a subsequent MM10 interrogation request if the result matches to an address specific trigger.

- The Routeing Address may contain a routeing address composed according to the MM4 address coding on SMTP level (refer to section 8.4.5.1). In this case the MMS Relay/Server shall analyse the FQDN provided. If the FQDN refers to the own domain, then the message is treated locally within the MMSE. If the FQDN refers not to the own domain, then the message shall be forwarded according to the definitions for the MM4 interface.

A Routeing Address provided in this format shall not be subject to a subsequent MM10 interrogation request.

If the Result Recipient Address contains no Routeing Address for a specific reference (sequence number) then the original recipient is omitted, i.e. removed from the list of recipients.

If the MSCF requests the recipient address to be kept unmodified, then the initial recipient address value shall be returned with its reference (sequence number).

Presentation Address

The Presentation Address is only applicable if a Routeing Address has been provided by the MSCF.

The value contained in the Presentation Address is used for identification presentation to the recipient user, i.e. the presentation of address information in the To:, CC: and BCC: fields presented to the recipient.

If a Presentation Address is provided by the MSCF in the MM10 interrogation response, then the MMS Relay/Server shall replace the corresponding address in the recipient field and store it together with the message for further processing.

The MMS Relay/Server shall not use the presentation address for message routeing purposes.

Sender Address

The Sender Address is used for sender identification to the recipient user, i.e. the presentation of address information in the From: field presented to the recipient.

If the sender address is provided by the MSCF in the MM10 interrogation response then the MMS Relay/Server replace the sender address field and store it together with the message for further processing.

In order to support delivery and read reply reporting via the MM4 interface, the Sender Address value has to refer to the address of the original sender. MSCF applications may take this into account when setting up values for this attribute. If the addressing service requires presentation of a "not routeable" sender address to the recipient, then a delivery report request should be suppressed.

Full support of delivery and read reply reports in conjunction with the MSCF may be defined in later versions of this specification.

7.1.17.5.1.2 Address specific trigger

7.1.17.5.1.2.1 Interrogation Request

After the user profile based interrogation or if no profile based trigger criteria was met the MMS Relay/Server shall check if an address specific trigger is in place. The verification of the address specific trigger shall be based on

- the outcome of the previous MM10 interrogation procedure if a profile based trigger was met. In this case the MMS Relay/Server shall consider only the Routeing Address part of the Result Recipient Address received from the MSCF,
- the recipient address information of the initial message if the user profile based trigger was not met.

The MMS Relay/Server shall analyse all recipient addresses of a submitted MM.

An address based trigger criteria is met if both the recipient address and the address criterion string match fully. Note, the address criterion definition may allow wildcards to define address ranges.

If the recipient address is a PLMN address the MMS Relay/Server shall first attempt to convert the address into international format based on the numbering plan of the HPLMN, i.e. the numbering plan applicable for the serving MMS Relay/Server. If successful the address comparison shall happen based on the international format version of the number.

If the recipient address can not be converted into international format (e.g. in case of short codes) the address digits shall be used for comparison unmodified.

If for one or several recipient addresses match the criteria, then the MMS Relay Server shall send an interrogation request to the MSCF as specified in section 8.9. One MM10 interrogation per matched recipient address shall be sent.

The MMS Relay/Server shall provide as the served user identity the sender's key identification as derived from the user's profile (e.g. the MSISDN).

In the Sender address parameter the MMS Relay/Server may provide the sender identification intended for presentation purposes. This identification may be either the sender address as provided by the MMS User Agent or the value of the Sender Address returned form an MSCF in result of the previous MM10 interrogation request for a user profile based trigger.

The MM10 interrogation request shall contain only the recipient address that matches the address specific trigger of the MMS Relay/Server. The MMS Relay/Server shall provide reference (sequence number) for the recipient address.

7.1.17.5.1.2.2 Interrogation Response

The MSCF shall respond to the MM10 interrogation request with an MM10 interrogation response as defined in section 8.9.

The MSCF may return result one or more recipient addresses. If the MSCF requests additional recipient addresses in the response (e.g. forwarding addresses), then it may allocate new reference numbers above the value used in the interrogation.

The result recipient address may consist of several components.

Routeing Address

If the result recipient address contains a Routeing Address then the MMS Relay/Server shall continue handling of the MM as follows:

- The Routeing Address may contain recipient addresses in all formats that are specified for the MM1 interface. In this case the MMS Relay/Server shall continue handling of the recipient according to the definitions of this specification for the MM1 interface.
- The Routeing Address may contain an routeing address composed according to the MM4 address coding on SMTP level (refer to section 8.4.5.1). In this case the MMS Relay/Server shall analyse the FQDN provided. If the FQDN refers to the own MMSE, then the message is treated internally. If the FQDN refers not to the own MMSE, then the message shall be forwarded according to the definitions for the MM4 interface.

If the Result Recipient Address contains no Routeing Address with a specific reference (sequence number) then the original recipient is omitted, i.e. removed from the list of recipients.

Note: Omission only effects the message to this individual address. Messages to multiple recipients not being subject to the address specific trigger may still contain unmodified addresses as provided by the sender.

If the MSCF requests the recipient address to be kept unmodified, then the initial recipient address value shall be returned with its reference (sequence number)

Presentation Address

The Presentation Address is only applicable if a Routeing Address has been provided by the MSCF.

The value contained in the Presentation Address is used for identification presentation to the recipient user, i.e. the presentation of address information in the To:, CC: and BCC: fields presented to the recipient.

If a Presentation Address is provided by the MSCF in the MM10 interrogation response, then the MMS Relay/Server shall store the modified recipient field together with the message for further processing.

The MMS Relay/Server must not use the presentation address for message routeing purposes.

Sender Address

The Sender Address is used only for sender identification to the recipient user provided by the result recipient address, i.e. the presentation of address information in the From: field presented to this recipient.

If the sender address is provided by the MSCF in the MM10 interrogation response then the MMS Relay/Server shall store the modified sender address with the message for further processing.

In order to support delivery and read reply reporting via the MM4 interface, the Sender Address value has to refer to the address of the original sender. MSCF applications may take this into account when setting up values for this attribute. If the addressing service requires presentation of a "not routeable" sender address to the recipient, then delivery and read reply report request should be suppressed.

Full support of delivery and read reply reports in conjunction with the MSCF may be defined in later versions of this specification.

7.1.17.5.2 MM1 Delivery

7.1.17.5.2.1 Interrogation Request

Prior to the notification about an MM to be delivered the MMS Relay/Server shall query the recipient's user profile entry for a profile specific trigger as defined in section 7.1.17.2. If a profile specific trigger for delivery is in place, the MMS Relay/Server shall suspend message processing and send the MM10 interrogation request as defined in section 8.9 to the MSCF.

The MMS Relay/Server shall provide as the served user identity the recipient's key identification as derived from the user's profile (e.g. the MSISDN).

The MM10 interrogation request shall contain the recipient addresses (including the served user) that are contained in the incoming message. For each of the recipient addresses a qualification of the used address field (To, CC, BCC) shall be given.

The MMS Relay/Server shall provide a unique identification of each of the recipient addresses in case of multiple recipients. This identification shall allow the MMS Relay/Server to track the modification of the original address after processing in the MSCF.

In the Sender address parameter the MMS Relay/Server shall provide the sender identification intended for presentation to the recipient MMS User Agent. This identification shall contain the sender address as received with the message to be delivered.

7.1.17.5.2.2 Interrogation Response

The MSCF is able to respond to the MM10 interrogation request with an MM10 interrogation response as defined in section 8.9. For the processing of the MM10 interrogation response the following principles shall apply:

The MSCF may return for each of the specific recipient addresses a result recipient address. This shall be achieved by returning the unique identification for each of the recipients. If the MSCF requests additional recipient addresses in the response (e.g. forwarding addresses), then it may allocate new reference numbers. The MCG shall continue to use reference number values greater then the highest value provided by the MMS Relay/Server in the Interrogation request.

Each result recipient address may consist of several components.

Routeing Address

A routeing address shall only be returned if the MSCF requests alternate recipient addresses for the message, i.e. to copy or forward the received MM.

If the result recipient address contains a Routeing Address then the MMS Relay/Server shall continue handling of the MM as follows:

- the Routeing Address may contain recipient addresses in all formats that are specified for the MM1 interface. In this case the MMS Relay/Server shall copy/forward the MM using the alternative recipient address,
- the Routeing Address may contain a recipient address composed according to the MM4 address coding on SMTP level (refer to section 8.4.5.1). In this case the MMS Relay/Server shall copy/forward the MM using the alternative recipient address. It shall analyse the FQDN provided. If the FQDN refers to the own MMSE, then the message is treated internally. If the FQDN refers not to the own MMSE, then the message shall be forwarded according to the definitions for the MM4 interface.

Presentation Address

The Presentation Address is used for identification presentation to the recipient user.

If a Presentation Address is provided by the MSCF in the MM10 interrogation response, then the MMS Relay/Server shall substitute the recipient field (To, CC, BCC) with this information. The MMS Relay/Server must not use the presentation address for message routeing or forwarding purposes.

Sender Address

The Sender Address is used for sender identification to the recipient user, i.e. the presentation of address information in the From: field presented to the recipient.

If the sender address is provided by the MSCF in the MM10 interrogation response the MMS relay server shall store the modified sender address with the message for further processing.

7.1.17.5.3 MM7 Submission

7.1.17.5.3.1 VASP Profile based trigger

7.1.17.5.3.1.1 Interrogation Request

For any MM7 submitted message the MMS Relay/Server shall query the VASP's profile entry for a profile specific trigger as defined in section 7.1.16.2. If a profile specific trigger for submission is in place, the MMS Relay/Server shall suspend message processing and send the MM10 interrogation request as defined in section 8.9 to the MSCF.

The MMS Relay/Server shall provide as the served user identity the sender's key identification as derived from the VASP's profile (e.g. VASP-ID, VAS-ID).

In the Sender address parameter the MMS Relay/Server may provide the sender identification intended for presentation purposes. This identification may be the sender address as provided by the VASP.

The MM10 interrogation request shall contain the list of all recipient addresses provided by the user in the submitted message. For each of the recipient addresses a qualification of the used address field (To, CC, BCC) shall be given.

The sender may request multiple recipients for one message. If the MM10 interrogation request is triggered due to a user profile based trigger then all recipient addresses shall be provided to the MSCF. The MMS Relay/Server shall provide a unique reference (sequence number) for each of the recipient addresses. This reference shall allow the MMS Relay/Server to track the modification of the original address after processing in the MSCF.

If the recipient address of the MM7_submit.REQ is provided in encrypted or obfuscated format then the MMS Relay/Server shall decrypt it prior to invocation of the MM10 interrogation request.

7.1.17.5.3.1.2 Interrogation Response

The MSCF shall respond to the MM10 interrogation request with an MM10 interrogation response as defined in section 8.9. For the composition and processing of the MM10 interrogation response the following principles shall apply:

The MSCF may return for each specific recipient addresses an result. The result shall provide a reference to the initial recipient address of the MM10 interrogation request by means of the unique reference (sequence number). If the MSCF requests additional recipient addresses in the response (e.g. forwarding addresses), then it shall allocate new reference numbers. The MCG shall continue to use reference number values greater then the highest value provided by the MMS Relay/Server.

The result recipient address may consist of several components.

Routeing Address

If the result recipient address contains a Routeing Address then the MMS Relay/Server shall continue handling of the MM as follows:

- the Routeing Address may contain recipient addresses in all formats that are specified for the MM7 interface. In this case the MMS Relay/Server shall continue handling of the recipient according to the definitions of this specification for the MM7 interface.

Note: A Routeing Address provided in this format may be subject to a subsequent MM10 interrogation request if for the result matches to an address specific trigger,

- the Routeing Address may contain an routeing address composed according to the MM4 address coding on SMTP level (refer to section 8.4.5.1). In this case the MMS Relay/Server shall analyse the FQDN provided. If the FQDN refers to the own domain, then the message is treated locally within the MMSE. If the FQDN refers not to the own domain, then the message shall be forwarded according to the definitions for the MM4 interface.
  Note: A Routeing Address provided in this format shall not be subject to a subsequent MM10 interrogation request.

If the Result Recipient Address contains no Routeing Address for a specific reference (sequence number) then the original recipient is omitted, i.e. removed from the list of recipients.

If the MSCF requests the recipient address to be kept unmodified, then the initial recipient address value shall be returned with its reference (sequence number).

Presentation Address

The Presentation Address is only applicable if a Routeing Address has been provided by the MSCF.

The value contained in the Presentation Address is used for identification presentation to the recipient user, i.e. the presentation of address information in the To:, CC: and BCC: fields presented to the recipient.

If a Presentation Address is provided by the MSCF in the MM10 interrogation response, then the MMS Relay/Server shall store the modified recipient field together with the message for further processing.

The MMS Relay/Server must not use the presentation address for message routeing purposes.

Sender Address

The Sender Address is used for sender identification to the recipient user, i.e. the presentation of address information in the From: field presented to the recipient.

If the sender address is provided by the MSCF in the MM10 interrogation response then the MMS Relay/Server shall store the modified sender address with the message for further processing.

In order to support delivery and read reply reporting via the MM4 interface, the Sender Address value has to refer to the address of the original sender. MSCF applications may take this into account when setting up values for this attribute. If the addressing service requires presentation of a "not routeable" sender address to the recipient, then delivery report request should be suppressed.

Full support of delivery and read reply reports in conjunction with the MSCF may be defined in later versions of this specification.

7.1.17.5.3.2 Address specific trigger

7.1.17.5.3.2.1 Interrogation Request

After the profile based interrogation or if no profile based trigger was identified the MMS Relay/Server shall check if an address specific trigger is in place. The verification of the address specific trigger shall be based on

- the outcome of the previous MM10 interrogation procedure if a profile based trigger was met. In this case the MMS Relay/Server shall consider only the Routeing Address part of the Result Recipient Address received from the MSCF.
- The recipient address information of the initial message if the user profile based trigger was not met.

The MMS Relay/Server shall analyse all recipient addresses of a submitted MM.

An address based trigger criteria is met if the both the recipient address and the address criterion string match fully. Note, the address criterion definition may allow wildcards to define address ranges.

If the recipient address is a PLMN address the MMS Relay/Server shall first attempt to convert the address into international format based on the numbering plan of the HPLMN, i.e. the numbering plan applicable for the serving

MMS Relay/Server. If successful the address comparison shall happen based on the international format version of the number.

If the recipient address can not be converted into international format (e.g. in case of short codes) the address digits shall be used for comparison unmodified.

If for one or several recipient addresses match the criteria, then the MMS Relay/Server shall send an interrogation request to the MSCF as specified in section 8.9. One MM10 interrogation per matched recipient address shall be sent.

The MMS Relay/Server shall provide as the served user identity the sender's key identification as derived from the user's profile (e.g. the MSISDN).

In the Sender address parameter the MMS Relay/Server may provide the sender identification intended for presentation purposes. This identification may be either the sender address as provided by the user agent or the value of the Sender Address returned form an MSCF in result of the previous MM10 interrogation request for a user profile based trigger.

The MM10 interrogation request shall contain only the recipient address that match the address specific trigger of the MMS Relay/Server. The MMS Relay/Server shall provide a reference (sequence number) for the recipient address.

7.1.17.5.3.2.2 Interrogation Response

The MSCF shall respond to the MM10 interrogation request with an MM10 interrogation response as defined in section 8.9. For the composition and processing of the MM10 interrogation response the following principles shall apply:

The MSCF may return result recipient addresses. If the MSCF requests additional recipient addresses in the response (e.g. forwarding addresses), then it may allocate new reference numbers above the value used in the MM10 interrogation.

The result recipient address may consist of several components.

Routeing Address

If the result recipient address contains a Routeing Address then the MMS Relay/Server shall continue handling of the MM as follows:

- the Routeing Address may contain recipient addresses in all formats that are specified for the MM1 interface. In this case the MMS Relay/Server shall continue handling of the recipient according to the definitions of this specification for the MM1 interface,
- the Routeing Address may contain an routeing address composed according to the MM4 address coding on SMTP level (refer to section 8.4.5.1). In this case the MMS Relay/Server shall analyse the FQDN provided. If the FQDN refers to the own MMSE, then the message is treated internally. If the FQDN refers not to the own MMSE, then the message shall be forwarded according to the definitions for the MM4 interface.

If the Result Recipient Address contains no Routeing Address with a specific reference (sequence number) then the original recipient is omitted, i.e. removed from the list of recipients.

Note: Omission only affects the message to this individual address. Messages to multiple recipients not being subject to the address specific trigger may still contain unmodified addresses as provided by the sender.

If the MSCF requests the recipient address to be kept unmodified, then the initial recipient address value shall be returned with its reference (sequence number)

Presentation Address

The Presentation Address is only applicable if a Routeing Address has been provided by the MSCF.

The value contained in the Presentation Address is used for identification presentation to the recipient user, i.e. the presentation of address information in the To:, CC: and BCC: fields presented to the recipient.

If a Presentation Address is provided by the MSCF in the MM10 interrogation response, then the MMS Relay/Server shall store the modified recipient field together with the message for further processing.

The MMS Relay/Server must not use the presentation address for message routeing purposes.

Sender Address

The Sender Address is used only for sender identification to the recipient user provided by the result recipient address, i.e. the presentation of address information in the From: field presented to this recipient.

If the sender address is provided by the MSCF in the MM10 interrogation response then the MMS Relay/Server shall store the modified sender address with the message for further processing.

In order to support delivery and read reply reporting via the MM4 interface, the Sender Address value has to refer to the address of the original sender. MSCF applications may take this into account when setting up values for this attribute. If the addressing service requires presentation of a "not routeable" sender address to the recipient, then delivery and read reply report request should be suppressed.

Full support of delivery and read reply reports in conjunction with the MSCF may be defined in later versions of this specification.

7.1.17.6 Access control

In result of a interrogation request the MSCF may deny the further handling of the Message. In this case the MSCF shall send a MM10 interrogation response with an appropriate result code. Deny of access may be applicable for sending or receiving Messages.

7.1.17.7 Interrogation Request Timeout

If the MSCF does not return an MM10 interrogation response to an MM10 interrogation request the MMS Relay/Server shall process the message according to the setting of the "recovery handling" parameter of the user's profile, i.e. either reject or accept the MM1 submission request.

7.1.17.8 Trigger Information Data in MM10 Interrogation Requests

The MMS user profile, the VASP profile or the address specific trigger criterion may contain an application identification required for the execution of the user specific service on the MSCF. The MMS Relay/Server shall forward this information transparently if available.

7.1.17.9 MSCF Addressing and Routeing

The user profile and the address specific trigger criterion shall contain the MSCF address information. The MMS Relay/Server shall use this information to derive a routeing address to forward the MM10 interrogation request to the MSCF.

7.1.18 Support for transporting Application Data

Apart from using MMS as a service for users to exchange messages, MMS may also be used to transport data specific to applications. Applications that intend to transport application specific data using MMS may either reside on an MMS User Agent or on an MMS VAS Application. Details of these applications or how an MMS User Agent or an MMS VAS Application would interface with them are outside the scope of this specification.

NOTE: Applications that want to transport data specific to applications other than MMS will initially need to register with the appropriate MMS User Agent or MMS VAS Application. During this registration process the application provisions an MMS User Agent or an MMS VAS Application with its application identification value and may negotiate with the MMS User Agent or MMS VAS Application the details (amount and format) of information to be exchanged between the two entities. The application registration process is outside the scope of this specification. The registration may be an inherent process e.g., in the application's integration into a mobile phone. It may also be the initial step after the download of a downloadable application to a mobile phone. Whatever the details of the application registration process are, an MMS User Agent or an MMS VAS Application acts according to the negotiated results from the application registration process.

Applications that reside on a MMS VAS Application are differentiated from the MMS VAS Application. These applications may trigger the MMS VAS Application as a MMS front-end to transmit or receive information formatted

in MMS abstract messages. Such applications have an additional level of addressing – in addition to the identification of the VASP and the MMS VAS Application.

When MMS is used to transport data specific to applications between two MMS User Agents or an MMS User Agent and an MMS VAS Application (or vice versa) the following exceptions to the normal MMS service behaviour apply:

7.1.18.1 Application Identifiers

The application identifier of the destination application shall be present in an abstract message, while the identifier of a "reply-path" and some additional application/implementation specific control information may be present in an abstract message.

The additional application/implementation specific control information shall be used for all future needs that are not supported by the application identifier of the destination application and the identifier of the originating application, such as specifying a particular logical channel in the application addressing method (e.g., "discussion thread #05") or distinguishing between multiple instances of the same application (e.g., "chess application #02").

The format of the application identifiers' values shall be text string.

In order to guarantee their global uniqueness, application identifiers shall either be specified as MIME types that are registered with IANA (www.iana.org) or shall be composed such that it includes the application developer's URL [72].

NOTE 1: IANA registers both standards-tree and vendor-tree MIME types; thus the use of MIME types guarantees global uniqueness while providing for both standard names and vendor-specific names.

NOTE 2: Including the application developer's URL as part of the application identifier's value guarantees global uniqueness. Details of the syntax are given in clause 8.4.4.8 for MM4, in Annex L for MM7 and in WAP/OMA implementation [82] for MM1 reference points.

7.1.18.2 Applications sending and receiving abstract messages

7.1.18.2.1 Sending abstract messages

Based on the negotiated details upon application registration process an application may trigger an MMS User Agent or an MMS VAS Application to submit certain abstract messages. Upon triggering an MMS User Agent or an MMS VAS Application to send an abstract message the MMS User Agent or MMS VAS Application may receive information from the application. The MMS User Agent or MMS VAS Application may insert this information in both the information elements and/or payload (if present) of the abstract message. The details for the above are according to the results of the application registration process.

Abstract messages that are sent by an MMS User Agent or an MMS VAS Application on behalf of an originating application shall contain a destination application identifier. They may, in addition, contain an application identifier which is to be used in reply-MMs and they may contain additional application/implementation specific control information.

7.1.18.2.2 Receiving abstract messages

If an MMS Relay/Server finds from the recipient MMS User Agent's capability indication (see clause 7.1.3.1) that the recipient MMS User Agent does not support the transport of application data, the MMS Relay/Server

- should delete the content of the MM before notifying the MMS User Agent or before retrieval. In such a case the recipient MMS Relay/Server shall apply the normal reporting behaviour towards receiving as well as sending entities;
- may decide about the deletion of content based on user setting in the user's profile and/or configuration by network operator and/or MMS service provider.

If the MMS Relay/Server finds from the recipient MMS User Agent's capability indication (see clause 7.1.3.1) that the recipient MMS User Agent supports transport of application data, the MMS Relay/Server

- shall not perform any type of content adaptation to a multimedia message (MM) that may be contained in the payload of an abstract message that contains a destination application identifer;

- shall pass on the destination application identifier, the "reply-path" identifier (if present) and the additional application/implementation specific control information (if present) unaltered.

Upon reception of an abstract message containing a destination application identifier (it can either be the MM1_notification.REQ, MM1_retrieve.RES or MM7_deliver.REQ transactions), the receiving MMS User Agent or MMS VAS Application shall first check if the destination application resides on it.

When an MM is addressed to an application, the associated MMS notification, intended for this application, should contain the application identifier.

NOTE: Should the application identifier not be present in the MMS notification this may result in the presentation of the MMS notification to the user.

If the destination application resides on a receiving MMS VAS Application, the MMS VAS Application shall immediately route the received MMS information on to the destination application that is referred to by the destination application identifier (based on the negotiated details upon application registration process).

If the destination application resides on a receiving MMS User Agent, the MMS User Agent shall immediately route the received MMS information on to the destination application that is referred to from the destination application identifier (based on the negotiated details upon application registration process) without presentation to the user.

NOTE: The further handling and processing of the information by the destination application is outside the scope of this specification.

If the destination application does not reside on the receiving MMS User Agent or on the USIM or MMS VAS Application, the MMS User Agent or MMS VAS Application shall discard the corresponding abstract message. In such a case the recipient MMS Relay/Server and recipient MMS User Agent or VAS application shall apply the normal reporting behaviour towards sending entities.

7.1.18.2.3 End User Confirmation

An MMS User Agent may ask for end user confirmation before any submission or retrieval of an MM triggered by an application due to charging, privacy or security reasons.

7.1.19 Cancelling of a Multimedia Message

This part of the MMS service describes the mechanism by which an MMS Relay/Server may request an MMS User Agent, that an MM which the MMS User Agent has already retrieved is to be cancelled. The MMS Relay/Server request shall be invoked by a similar request from a VASP.

The support for cancelling an MM from the recipient MMS User Agent is optional for both MMS User Agent and MMS Relay/Server.

When requesting an MM to be cancelled the MMS Relay/Server shall provide the identification of the MM to be cancelled.

MMS User Agent may provide means (e.g. terminal setting) to a user to forbid such cancellation, requested by the MMS Relay/Server.

The MM cancellation may not be successful as the recipient MMS User Agent may have restricted such a cancellation or the MM is not available any longer. However, upon reception of a request from the MMS Relay/Server to cancel an MM, the MMS User Agent may provide the status (if the request was successfully received) in the response to the MMS Relay/Server.

7.1.20 Deletion of Multimedia Messages on an MMS Relay/Server

This part of the MMS service describes the mechanism by which an MMS User Agent may request the recipient MMS Relay/Server, to delete one or more of its MMs for which retrieval has been deferred.

NOTE: An MM may no longer be available on the recipient MMS Relay/Server after MM retrieval, MM forwarding, or other MMS User Agent actions.

The support for deletion of a deferred MM on an MMS Relay/Server is optional for the MMS User Agent and for the MMS Relay/Server.

If supported the MMS User Agent shall request deletion of a deferred MM based on the Message Reference(s) received in the corresponding notification(s).

Upon reception of a request from the MMS User Agent, the MMS Relay/Server:

- Shall ensure that the deletion request comes from the MMS User Agent associated with the MMs;
- Should free resources associated with these MMs' Message Identification;
- Shall provide status information (per MM, or group of MMs) on the MM deletion request to the MMS User Agent.

7.2 MMSE Addressing responsibilities

Address parsing:

MMS Relay/Server should parse the recipient address field provided by the originator MMS User Agent upon MM submission. If an error is found in the address format, an error indication should be sent back to the MMS User Agent in the submit response.

Locating the recipient:

For each recipient that appears in an MM, the MMS Relay/Server shall be able to resolve whether the recipient belongs to the same MMSE, another MMSE or is not known to belong to any MMSE or the recipient is VASP. If the recipient belongs to the same MMSE, the MMS Relay/Server shall notify the recipient of the new MM as described in clause 7.1.2. If the recipient appears to belong to another MMSE, the MMS Relay/Server has to locate the external recipient's MMSE domain. If the recipient is not known to belong to any MMSE, the MMS Relay/Server shall perform the necessary conversion and route forward the message to the recipient. If the recipient is VASP, the MMS Relay/Server shall deliver MM to the VASP according to the recipient address in MM.

7.2.1 Address Formats on MM1

The MMS addressing model on MM1 contains three addresses: the address of the MMS Relay/Server, the address of the recipient and the address of the originator. The address of the MMS Relay/Server shall be the URI of the MMS Relay/Server given by the MMS service provider. Thus, the URI needs to be configurable in the MMS User Agent.

The originator's a address could be either a user's address or a user's terminal address. The recipient's address can be a user's address, a user's terminal address, or a short code. For this release the user's terminal addresses (e.g. terminal IP addresses) are not supported. The MMS User Agent's responsibility is to format these addresses before it submits the message to the originator MMS Relay/Server.

The user's address can be either an E.164 (MSISDN) or RFC2822 address.

The MMS User Agent and MMS Relay/Server shall support both E.164 (MSISDN) and RFC2822 addressing formats. The reference point MM1 should support a way to indicate the used address type to enable future extension. The encoding of the addressing is up to the corresponding MM1 implementation (cf. Annex B).

E.g. the originator MMS User Agent may specify each of the address fields in one of the following formats:

1) RFC 2822 address (FQDN or unqualified)
2) PLMN address: ["+" | "*" | "#"] [*digit* | *"*"* | *"#"*] … ["/TYPE= PLMN"]
3) Other "/TYPE= "

The "/TYPE= " field specifies the address type. When PLMN format is used the type is optional. The "/TYPE= " convention provides flexibility for future enhancements.

When the "/TYPE=" qualifier is absent, the MMS Relay/Server should resolve potential ambiguities by applying the following logic to the address in the following order:

1. if it contains the "@" character, the address should be interpreted as an FQDN RFC2822 address

2. if it is completely numeric, except possibly including "+", "*", or "#", it should be interpreted as "/TYPE= PLMN", e.g. an E.164 address, a local telephone number, or a numeric short code,

3. otherwise, it should be interpreted as an unqualified RFC2822 address (alphanumeric short code)

7.2.2 Address Formats on MM4

Resolving the recipient's MMSE IP address:

For those recipients that appear in an MM and belong to an external MMSE, the originator MMS Relay/Server has to send the message to each of the recipients' MMS Relay/Servers using the protocol described in clause 6.6. The MMS Relay/Server has to resolve the recipient's MMS Relay/Server domain name to an IP address, e.g. using DNS, based on the recipient's address. The mapping for the recipient's address, in case of MSISDN (E.164) addressing, to the recipient's MMS Relay/Server if the MM recipient belongs to another MMSE should use the DNS-ENUM protocol [61]. The ENUM solution is described in Annex G. In the absence of an ENUM based solution, it is expected that MMS service providers or network operators may use solutions for their particular needs, which may include static tables or other look-up methods. One such look up method, which is based on MSISDN to IMSI look up, is described in Annex H.

Re-formatting the sender's and recipient's address to FQDN format

When delivering a message from an MMSE to another MMSE, both the sender and the recipient addresses shall be extended to include the FQDN to enable transport over SMTP. This FQDN format shall be used in the MM4 reference point. It is required that FQDN format address is used in "MAIL FROM: " and "RCPT TO: " commands in SMTP, it is not necessary that the originator's and recipient's addresses in [5] "From: " or "To"–fields are re-formatted to FQDN format.

The encoding of FQDN addressing is defined in Clause 8.4.5.1.

7.2.3 Address Formats on MM7

The MMS addressing model on MM7 contains two addresses: The address of the originator MMS User Agent or VAS/VASP and the address(es) of the recipient MMS User Agent(s) or VAS/VASP.

The reference point MM7 shall support E.164 (MSISDN) addresses and e-mail addresses (RFC2822). In addition Short Codes should be supported.

In the case of a multimedia message terminated at the VAS/VASP, the recipient(s)' address(es) may be the VAS/VASP address or the intended recipient(s)' address and the originator's address shall be user's address (e.g. MSISDN address) or a user's terminal address. For this release the user's terminal addresses (e.g. terminal IP addresses) are not supported.

The MMS Relay/Server shall translate recipient addresses that originate from the MM1 interface into the appropriate URL of the VASP, for example when an MM7_deliver.REQ results from an MM1_submit.REQ from the MMS User Agent. The format of the MM1 address is defined in section 7.2.1 of this specification.

In the case of a multimedia message originated from the VAS/VASP, the originator's address may be the VAS/VASP address and the recipient(s)' address(es) shall be either a user's address or a user's terminal address. For this release the user's terminal addresses (e.g. terminal IP addresses) are not supported.

The VASP's responsibility is to format recipient addresses before it submits the message to the MMS Relay/Server. The recipient user's address shall be E.164 (MSISDN) address or e-mail address (RFC2822). Additionally, it shall be possible to control which recipient(s) address(es) are utilized for actual routing and which are conveyed as informational only to be displayed to the recipient MMS User Agent.

The VASP will identify itself using one (or more) of three possible identifiers – the VASP identification number, the VAS identification number, or an address MM1 compliant to MM1 address format. The MMS Relay/Server shall translate the identification of the VASP to an appropriate address format for transfer across other reference points, e.g. address as defined in section 7.2.1 for messages sent on MM1.

The reference point MM7 defines also other addressing like information elements: VASP ID, VAS ID and MMS Relay/Server ID. These fields are used only to identify VASP, VAS and MMS Relay/Server and are not used for addressing purpose.

NOTE: The users' addresses referred to above may be replaced by appropriate coded addresses in order not to harm the users' privacy.

8 MMS Application Protocol Framework and Technical Realisation of MMS Service Features

This clause defines the application protocol framework and describes the technical realisation of MMS service features in terms of abstract messages. The abstract messages can be categorised into *transactions* consisting of *requests* and *responses*. The labelling of the MMS abstract messages follows these conventions:

- the transactions between the MMS UA and MMS Relay/Server are prefixed with "MM1";
- the transactions between the MMS Relay/Servers are prefixed with "MM4";
- the transactions between Value-Added Service Providers and the MMS Relay/Server are prefixed with "MM7";
- requests are identified with ".REQ" as a suffix;
- responses are identified with the ".RES" suffix.

Each abstract message carries with it certain information elements, which may vary according to the specific message. All messages shall carry, as information elements, a protocol version and message type, in order that the MMSE components may be able to properly identify and manage the message contents.

Specific information regarding the message encapsulation, including order, possible values, and encoding are beyond the scope of this clause. These details will be defined within each MMSE protocol environment.

The mapping of abstract messages to specific protocols is not necessarily a one-to-one relationship. Depending on the MMS Implementation (WAP etc.), one or more abstract messages may be mapped to a single lower layer PDU, and a single abstract message may be mapped to multiple lower layer PDUs, if the information carried in the PDU(s) serve the purpose of required information in the subjected abstract message(s).

In MM1 responses that provide a status information, the status information returned has no correspondence to the Status information returned in MM4 responses; they are independent of each other.

The MM1 response status, which are limited by design to as small a set of values as possible, may correlate to status and errors occurring within the communications protocols underlying the implementation of the MM4 abstract messages. Similarly, the MM4 status may correlate to those occurring within the communications protocols underlying the implementation of the MM1 abstract messages. The definition of these correlations is out of scope of the present document, and should be provided by the MMS implementations.

The MMS application protocol shall provide means to uniquely identify the version number and message type in each abstract message defined here. The order, possible values and encoding of the information elements for each abstract message are beyond the scope of this clause, and shall be dictated by the protocol environment.

The following figure shows an example abstract message flow when a multimedia message is sent from an originator MMS User Agent to a recipient MMS User Agent. The scope of this figure is limited to abstract messages on reference points MM1 and MM4 only.

Delivery reports are sent by the recipient MMS Relay/Server. Read-reply reports are sent by the recipient MMS User Agent.

Below are Figures 6 and 7. Figure 6 shows a typical transaction for an MMS User Agent submitting an MM addressed to an MMS User Agent serviced by another MMS Relay/Server. Figure 7 shows the abstract messages that may involve the MMBox. These figures are only examples, and do not show all possible transactions between a MMS User Agent and the MMS Relay/Server.

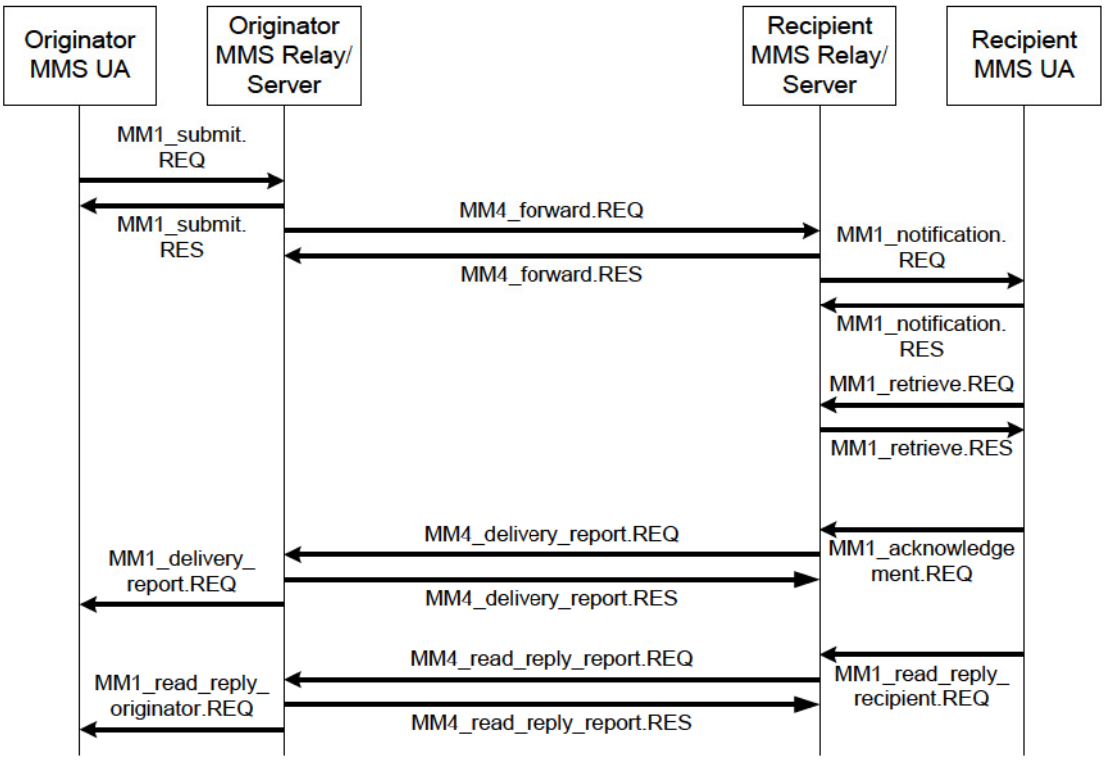


Figure 6: Example Abstract Message Flow

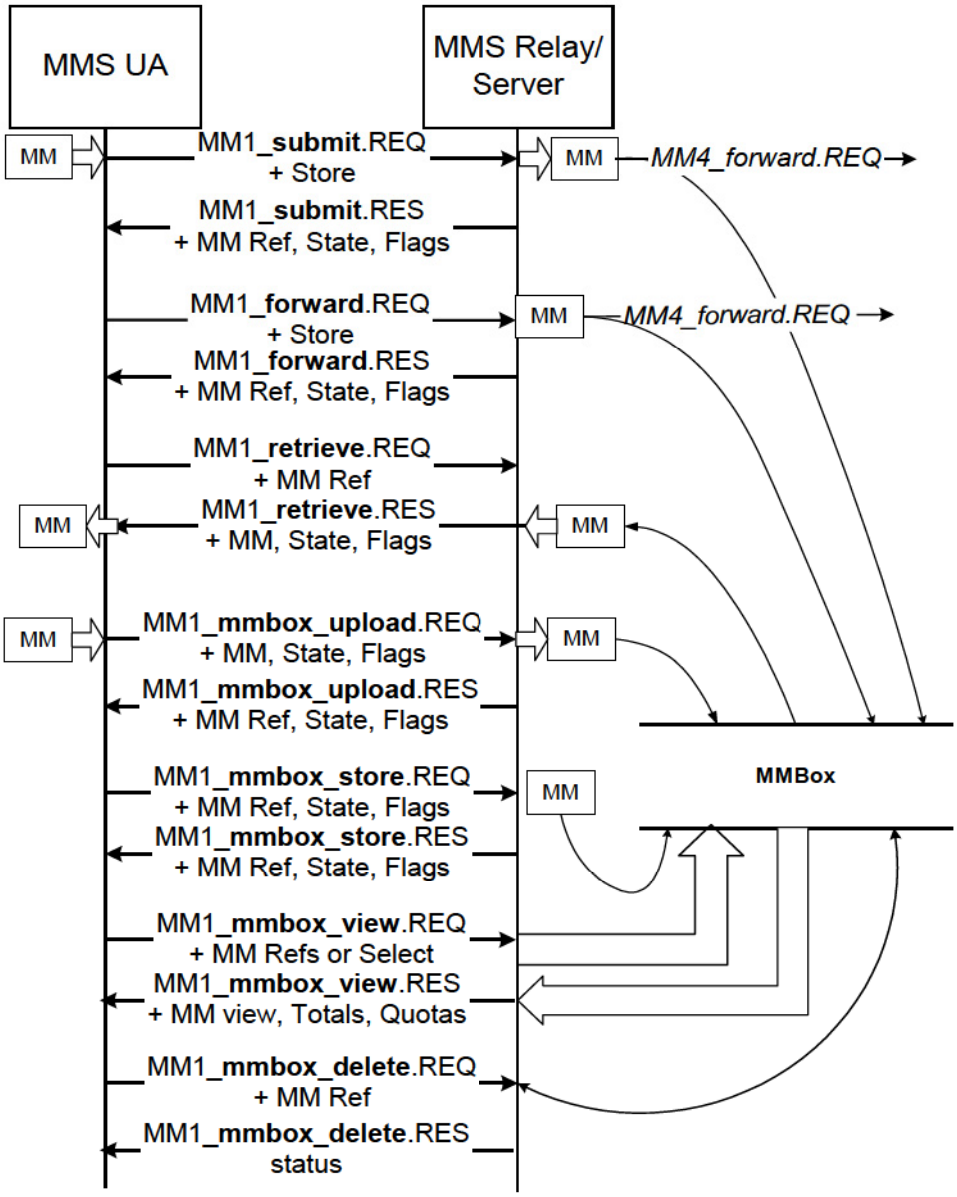


Figure 7: Example Abstract Message Flows with Persistent Storage

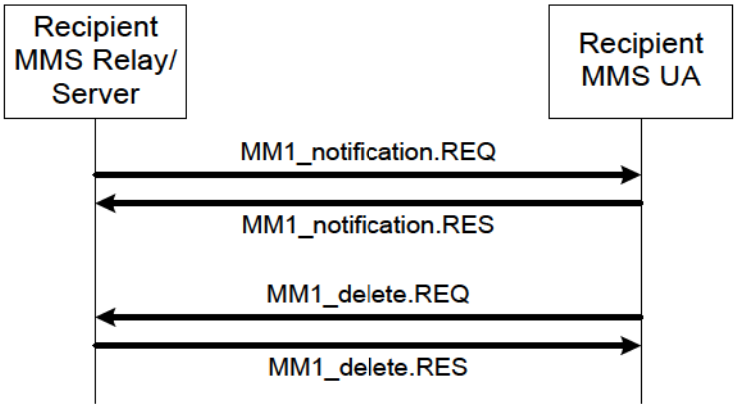


Figure 7A: Example Abstract Message Flow, for deletion of deferred MMs

8.1 Technical realisation of MMS on reference point MM1

Reference point MM1 defines the transactions between the MMS User Agent and the MMS Relay/Server. These transactions include notifications of new MMs, retrieval of MMs, forwarding of MMs, and delivery and read-reply reporting. Figure 6 illustrates some of these transactions and their relationships, in an end-to-end manner.

Additional transactions are specified for MMBox implementations that allow MMs and information about them to be stored, retrieved, changed, and deleted.

8.1.1 Authentication Mechanisms for MM1

On the MM1 reference point an underlying authentication mechanism should be available.

The network-provided MMS User Agent's ID (e.g. MSISDN or IMSI) should be made available to the MMS Relay/Server by the RADIUS mechanisms defined in [54]. This ID should be used to authenticate the MMS User Agent.

8.1.2 Detection of Duplicate MMs

On the MM1 reference point an underlying mechanism for detecting the submission of duplicate MMs should be available.

8.1.3 Submission of Multimedia Message

This part of MMS service covers the submission of an MM. For sending purposes a terminal-originated MM shall always be submitted from the originator MMS User Agent to the corresponding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 4: Abstract messages for submission of MM in MMS

Abstract messages	Type	Direction
MM1_submit.REQ	Request	MMS UA -> MMS Relay/Server
MM1_submit.RES	Response	MMS Relay/Server -> MMS UA

8.1.3.1 Normal operation

The originator MMS User Agent shall submit a terminal-originated MM to the originator MMS Relay/Server using the MM1_submit.REQ, which contains MMS control information and the MM content. If the Store information element is present, the MM will also be copied to the MMBox, if the MMBox is supported and enabled for the subscriber.

The MMS Relay/Server shall respond with an MM1_submit.RES, which provides the status of the request. The MM1_submit.RES shall unambiguously refer to the corresponding MM1_submit.REQ.

Support for MM1_submit.REQ is optional for the MMS UA, support for MM1_submit.RES is mandatory for the MMS Relay/Server.

8.1.3.2 Abnormal Operation

In this case the originator MMS Relay/Server shall respond with a MM1_submit.RES encapsulating a status which indicates the reason the multimedia message was not accepted, e.g. no subscription, corrupt message structure, service not available, MMBox not supported, MMBox not enabled, MMBox over quota, MMBox system full, MMBox I/O error.

If the MMS Relay/Server does not provide the MM1_submit.RES the MMS User Agent should be able to recover.

8.1.3.3 Features

Addressing: One or several MM recipients of a submitted MM shall be indicated in the addressing-relevant information field(s) of the MM1_submit.REQ. The originator of a submitted MM may be indicated in addressing-relevant information field(s) of the MM1_submit.REQ. The originator MMS User Agent may request to hide its identity from the MM recipient.

Time stamping: The originator MMS User Agent may time stamp the MM.

Time constraints: The originator MMS User Agent may also request an earliest desired time of delivery of the MM. The originator MMS User Agent may request a time of expiry for the MM. In case of reply-charging the originator MMS User Agent may also request a deadline for the latest time of submission of reply-MMs granted to the recipient(s).

Reply-Charging: The originator MMS User Agent may indicate that the sender wants to pay for a reply-MM and convey the reply-charging limitations (e.g. the latest time of submission and/or the maximum size of a reply-MM) in the MM1_submit.REQ.

Message class, priority and subject: The MM may be qualified further by adding a message class, priority and/or subject to the MM in the MM1_submit.REQ. Additional qualifiers may be added.

Reporting: The originator MMS User Agent may request a delivery report for the MM. In addition, the originator MMS User Agent may request a read-reply report when the user has viewed the MM.

Identification: The originator MMS Relay/Server shall always provide a message identification for an MM, which it has accepted for submission in the MM1_submit.RES. In case of reply-charging the MMS User Agent which submits a reply-MM (i.e. the MMS User Agent that received the original MM) shall provide the message ID of the original MM which it replies to in the MM1_submit.REQ.

Persistent storage: In addition to being submitted for normal delivery, the MMS User Agent may request that the submitted MM be stored into the MMBox, by the presence of the Store information element. As part of the store request, the MM State and MM Flags can be set with the use of corresponding information elements. The response to a Store request shall include a Message Reference to the newly stored MM, as well as the associated MM State and optional MM Flags.

Store Status: The MMS Relay/Server shall indicate the store status of the MM1_submit.REQ in the Store Status information element of the associated MM1_submit.RES. The Store Status information element of the MM1_submit.RES may be supported with an explanatory text. If this text is available in the Store Status Text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Store Status Text information element is at the discretion of the MMS service provider

Content Type: The MIME type of the multimedia content shall always be identified in the MM1_submit.REQ.

Content: The originator MMS User Agent may add content in the MM1_submit.REQ.

Request Status: The originator MMS Relay/Server shall indicate the status of the MM1_submit.REQ in the associated MM1_submit.RES. The reason code given in the status information element of the MM1_submit.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Transaction Identification: The originator MMS User Agent shall provide an unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_submit.REQ and MM1_submit.RES as such.

Applic-ID: The presence of this information element indicates that this abstract message shall be provided to an application residing on an MMS User Agent or MMS VAS Application. It contains the identification of the destination application.

Reply-Applic-ID: If present, this information element indicates a "reply path" , i.e. the identifier of the application to which delivery reports, read-reply reports and reply-MMs are addressed if any.

Aux-Applic-Info: If present, t his information element indicates additional application/implementation specific control information (cf. 7.1.18.1).

Content adaptation restriction: The originator may request that the content of the MM will not be subjected to content adaptation.

Content Information: The originator may provide information about the nature of the content in the message. The content information could be in terms of indications that:

- classifies content of the MM based on e.g. media types/formats, size, presentation formats [85]
- the MM contains DRM-protected content

In case of conflict with the adaptation restriction provided by the originator, DRM-protection rules in content adaptation shall prevail over the adaptation restriction.

8.1.3.4 Information Elements

Table 5: Information elements in the MM1_submit.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_submit.REQ
Transaction ID	Mandatory	The identification of the MM1_submit.REQ/MM1_submit.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS UA.
Recipient address	Mandatory	The address of the recipient(s) of the MM. Multiple addresses are possible.
Content type	Mandatory	The content type of the MM's content.
Sender address	Optional	The address of the MM originator.
Message class	Optional	The class of the MM (e.g., personal, advertisement, information service)
Date and time	Optional	The time and date of the submission of the MM (time stamp).
Time of Expiry	Optional	The desired time of expiry for the MM or reply-MM (time stamp).
Earliest delivery time	Optional	The earliest desired time of delivery of the MM to the recipient (time stamp).
Delivery report	Optional	A request for delivery report.
Reply-Charging	Optional	A request for reply-charging.
Reply-Deadline	Optional	In case of reply-charging the latest time of submission of replies granted to the recipient(s) (time stamp).
Reply-Charging-Size	Optional	In case of reply-charging the maximum size for reply-MM(s) granted to the recipient(s).
Priority	Optional	The priority (importance) of the message.
Sender visibility	Optional	A request to show or hide the sender's identity when the message is delivered to the recipient.
Store	Optional	A request to store a copy of the MM into the user's MMBox, in addition to the normal delivery of the MM.
MM State	Optional	The value to set in the MM State information element of the stored MM, if Store is present.
MM Flags	Optional	One or more MM Flag keywords to set in the MM Flags information element of the stored MM, if Store is present
Read reply	Optional	A request for read reply report.
Subject	Optional	The title of the whole multimedia message.
Reply-Charging-ID	Optional	In case of reply-charging when the reply-MM is submitted within the MM1_submit.REQ this is the identification of the original MM that is replied to.
Applic-ID	Optional	Identification of the destination application.
Reply-Applic-ID	Optional	Identification of an application to which reply-MMs, delivery reports and read-reply reports are addressed.
Aux-Applic-Info	Optional	Auxiliary application addressing information.
Content Class	Optional	Classifies the content of the MM to the smallest content class to which the MM belongs [85].
DRM Content	Optional	Indicates if the MM contains DRM-protected content
Adaptations	Optional	Indicates if the originator allows adaptation of the content (default True)
Content	Optional	The content of the multimedia message

Table 6: Information elements in the MM1_submit.RES.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_submit.RES.
Transaction ID	Mandatory	The identification of the MM1_submit.REQ/MM1_submit.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Request Status	Mandatory	The status of the MM submit request.
Request Status Text	Optional	Description which qualifies the status of the MM submit request.
Message ID	Conditional	The identification of the MM if it is accepted by the originator MMS Relay/Server.
Store Status	Conditional	If the Store request was present in MM1_submit.REQ, the status of the store request.
Store Status Text	Optional	The explanatory text corresponding to the Store Status, if present.
Stored Message Reference	Conditional	If the Store request was present in MM1_submit.REQ, the message reference to the newly stored MM.

8.1.4 Multimedia Message Notification

This part of the MMS service covers the notification about MM from the recipient MMS Relay/Server to the corresponding recipient MMS User Agent and involving abstract messages are outlined in the table below from type, and direction points of view.

Table 7: abstract messages for notification of MM in MMS

Abstract message	Type	Direction
MM1_notification.REQ	Request	MMS Relay/Server -> MMS UA
MM1_notification.RES	Response	MMS UA -> MMS Relay/Server

8.1.4.1 Normal Operation

Upon receiving the MM1_notification.REQ, the recipient MMS User Agent shall respond with the MM1_notification.RES to the recipient MMS Relay/Server to acknowledge the successful reception of the MM1_notification.REQ.

The MM1_notification.RES shall unambiguously refer to the corresponding MM1_notification.REQ.

8.1.4.2 Abnormal Operation

In this case the MMS UA shall respond with a MM1_notification.RES encapsulating a status which indicates the reason the notification could not be processed. If the MMS UA does not provide the MM1_notification.RES the MMS Relay/Server should be able to retransmit the notification at a later state.

8.1.4.3 Features

Addressing: The MM originator address may be provided to the recipient MMS User Agent in the MM1_notification.REQ. The MM originator address shall not be provided to the recipient MMS User Agent if the MM originator has requested her address to be hidden from the MM recipient. In the case of forwarding, the address of the latest forwarding MMS User Agent shall be provided.

Time constraints: The recipient MMS User Agent shall be provided a time of expiry of the MM. In case of reply-charging the deadline for the latest time of submission of a reply-MM should be conveyed within the MM1_notification.REQ.

Reply-Charging: In case of reply-charging the MMS Relay/Server may indicate in the MM1_notification.REQ that a reply to the notified original MM is free of charge and the reply-charging limitations.

Message class, message size, priority and subject: The MM shall be qualified further by adding a message class and an approximate size to the MM in the MM1_notification.REQ. The MM may be qualified further by adding a priority and/or subject to the MM. Additional qualifiers may be added.

Reporting: If the originator MMS User Agent has requested to have a delivery report, the recipient MMS Relay/Server may convey this information to the recipient MMS User Agent in the MM1_notification.REQ. The recipient MMS User Agent may indicate in the MM1_notification.RES that it would not wish a delivery report to be created.

Identification: In case of reply-charging when a reply-MM is notified within the MM1_notification.REQ the MMS Relay/Server should convey the identification of the original MM replied to within the same MM1_notification.REQ.

Persistent storage: When the MMBox is configured such that incoming MMs are stored automatically, the MM1_notification.REQ shall contain the Stored information element.

Message Reference: The recipient MMS Relay/Server shall always provide a reference, e.g., URI, for the MM in the MM1_notification.REQ. When incoming MMs are stored automatically, the Message Reference will refer to the newly stored MM within the MMBox.

MM Status: The recipient MMS User Agent may indicate in the MM1_notification.RES how it intends the MM to be handled, e.g. the immediate rejection of the MM.

MM element descriptor: The recipient MMS Relay/Server may provide one or more description(s) of message elements in the MM1_notification.REQ. A description shall contain a reference to the message element, e.g. a URI, an index number etc.. A description of a message element may be further qualified by adding one or more of such parameters as:

- name of the message element
- type and format of the message element
- approximate size of the message element

Message Distribution Indication: The VASP may indicate whether the content of the MM is intended for redistribution.

NOTE: From REL-6 onwards, in case of misalignment, DRM-protection rules shall prevail over the Message Distribution Indication feature.

Transaction Identification: The originator MMS Relay/Server shall provide an unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_notification.REQ and MM1_notification.RES as such.

MM recommended retrieval mode: the MMS Relay/Server may include an indication about the recommended manual retrieval mode of the MM. This indication code may be supported with an explanatory text (e.g. indication about charging related information if recipient has to pay for the retrieval or roaming condition) further expliciting why the manual retrieval mode is recommended for the MM.

Applic-ID: This information element contains the identification of the destination application. Upon reception, the recipient MMS User Agent shall provide this MM1_notification.REQ to the specified destination application.

Reply-Applic-ID: If present, this information element may be used by the originating application to indicate a "reply path" to the destination application residing on the receiving MMS User Agent or MMS VAS Application. It contains the application identifier which shall be used by the recipient MMS User Agent when a reply-MM or a read-reply report is created.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.18.1).

Content Information: The MMS Relay/Server may provide information about the nature of the content in the message. The content information could be in terms of indications that:

- classifies content of the MM based on e.g. media types/formats, size, presentation formats [85]
- the MM contains DRM-protected content

Replace identification: If requested by a VASP in MM7_extended_replace.REQ, the MMS Relay/Server shall provide identification of a previous MM, which is replaced by the MM associated with the notification.

8.1.4.4 Information Elements

Table 8: Information elements in the MM1_notification.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_notification.REQ
Transaction ID	Mandatory	The identification of the MM1_notification.REQ/MM1_notification.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message class	Mandatory	The class of the MM (e.g., personal, advertisement, information service; default = personal)
Message size	Mandatory	The approximate size of the MM
Time of expiry	Mandatory	The time of expiry for the MM (time stamp).
Message Reference	Mandatory	a reference, e.g., URI, for the MM
Subject	Optional	The title of the whole MM; may be truncated by the MMS Relay/Server.
Priority	Optional	The priority (importance) of the message.
Sender address	Conditional	The address of the MMS User Agent that most recently handled the MM, i.e. that either submitted or forwarded the MM. If the originator MMS User Agent has requested her address to be hidden from the recipient her address shall not be provided to the recipient.
Stored	Optional	Indicates that the MM was automatically stored into the MMBox.
Delivery report	Optional	Request for delivery report
Reply-Charging	Optional	Information that a reply to this particular original MM is free of charge.
Reply-Deadline	Optional	In case of reply-charging the latest time of submission of a reply granted to the recipient (time stamp).
Reply-Charging-Size	Optional	In case of reply-charging the maximum size of a reply-MM granted to the recipient.
Reply-Charging-ID	Optional	The identification of the original MM replied to if this notification indicates a reply-MM.
Element-Descriptor	Optional	The reference for an element of the MM, which may contain further information about the referenced element of the MM, e.g. the name, the size and/or the type and format of the message element
MM recommended retrieval mode	Optional	Indication that manual retrieval mode is recommended for this MM
Text explaining MM recommended retrieval mode	Optional	Description that explicits why the manual retrieval mode is recommended for the MM.
Message Distribution Indicator	Optional	If set to "false" the VASP has indicated that content of the MM is not intended for redistribution. If set to "true" the VASP has indicated that content of the MM can be redistributed (NOTE).
Applic-ID	Optional	Identification of the destination application.
Reply-Applic-ID	Optional	Identification of an application to which reply-MMs and read-reply reports are addressed.
Aux-Applic-Info	Optional	Auxiliary application addressing information.
Content Class	Optional	Classifies the content of the MM to the smallest content class to which the MM belongs [85]
DRM Content	Optional	Indicates if the MM contains DRM-protected content
Replace-ID	Conditional	Identifier of the previous MM that is replaced by the current MM, if requested by a VASP
NOTE: From REL-6 onwards, in case of misalignment between the value assigned to MDI and DRM-protection rules, the latter shall prevail.		

Table 9: Information elements in the MM1_notification.RES.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_notification.RES.
Transaction ID	Mandatory	The identification of the MM1_notification.REQ/MM1_notification.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
MM Status	Optional	The status of the MM's retrieval
Report allowed	Optional	Request to allow or disallow the sending of a delivery report to the MM originator

8.1.5 Retrieval of Multimedia Message

This part of MMS service covers the retrieval of an MM. For retrieval purposes an MM shall always be retrieved by the recipient MMS User Agent from the recipient MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 10: Abstract messages for retrieval of MM in MMS

Abstract messages	Type	Direction
MM1_retrieve.REQ	Request	MMS UA -> MMS Relay/Server
MM1_retrieve.RES	Response	MMS Relay/Server -> MMS UA
MM1_acknowledgement.REQ	Request	MMS UA -> MMS Relay/Server

8.1.5.1 Normal Operation

The recipient MMS User Agent shall issue an MM1_retrieve.REQ to the recipient MMS Relay/Server to initiate the retrieval process. The MMS Relay/Server shall respond with an MM1_retrieve.RES, which contains MMs control information and the MM content.

After receiving the MM1_retrieve.RES, the recipient MMS User Agent shall send an MM1_acknowledgement.REQ to the corresponding MMS Relay/Server, if requested by the MMS Relay/Server. The MM1_acknowledgement.REQ shall unambiguously refer to the corresponding MM1_retrieve.RES.

8.1.5.2 Abnormal Operation

If the recipient MMS Relay/Server can not process the MM1_retrieve.REQ, for example due to invalid content location or expiration of the message, the recipient MMS Relay/Server shall respond with either an MM1_retrieve.RES or a lower protocol layer error message encapsulating a status which indicates the reason to the MMS User Agent the multimedia message was not delivered.

If the MMS Relay/Server does not provide the MM1_retrieve.RES or the lower protocol layer error message the MMS User Agent should be able to recover.

8.1.5.3 Features

Message Reference: The recipient MMS User Agent shall provide a reference, e.g., URI, for the MM in the MM1_retrieve.REQ.

This reference was previously delivered to the MMS User Agent from MM1_notification.REQ, MM1_submit.RES, MM1_forward.RES, MM1_mmbox_view.RES, MM1_mmbox_upload.RES, or MM1_mmbox_store.RES. In the latter cases, the Message Reference will address an MM that resides in the MMBox.

Addressing: The MM originator address may be provided to the recipient MMS User Agent in the addressing-relevant information field of MM1_retrieve.RES. The MM originator address shall not be provided to the recipient MMS User Agent if the MM originator has requested her address to be hidden from the MM recipient. In the case of forwarding, the address of the latest forwarding MMS User agent shall be provided and the address(es) of the previous forwarding MMS User Agent(s) and the address of the originator MMS User Agent may be provided. One or several address(es) of

the MM recipient(s) may be provided to the recipient MMS User Agent in the addressing-relevant information field(s) of the MM1_retrieve.RES.

Time stamping: The MM1_retrieve.RES shall carry the time and date of the most recent handling of the MM by an MMS User Agent (i.e. either submission or the most recent forwarding of the MM). In the case of forwarding, the MM1_retrieve.RES may in addition carry the time and date of the submission of the MM.

Time constraints: In case of reply-charging the deadline for the latest time of submission of a reply-MM shall be conveyed within the MM1_retrieve.RES.

Message class, priority and subject: Information about class, priority, subject of the MM shall be included in the MM1_retrieve.RES according to their presence and value received at the MMS Relay/Server. Information about additional end-to-end qualifiers of the MM should be included in the MM1_retrieve.RES according to their presence and value received at the MMS Relay/Server.

Reporting: If the originator MMS User Agent has requested to have a read-reply report, the recipient MMS Relay/Server shall convey this information in the MM1_retrieve.RES. If the originator MMS User Agent has requested to have a delivery report, the recipient MMS Relay/Server may convey this information to the recipient MMS User Agent in the MM1_retrieve.RES.

If a request for a delivery report is included in the MM1_retrieve.RES the recipient MMS User Agent shall convey the information whether it accepts or denies the sending of a delivery report to the MM originator in MM1_acknowledgement.REQ.

If a delivery report is not requested, it is up to the recipient MMS User Agent to include this information in MM1_acknowledgement.REQ or not.

Reply-Charging: In case of reply-charging the MMS Relay/Server should indicate in the MM1_retrieve.RES that a reply to this particular original MM is free of charge and the reply-charging limitations.

Identification: The MMS Relay/Server shall provide a message identification for a message, which it has accepted for delivery in the MM1_retrieve.RES. In case of reply-charging the MMS Relay/Server shall provide the message ID of the original MM which is replied to in the MM1_retrieve.RES.

Persistent storage: In the MM1_retrieve.RES, the MMS Relay/Server shall convey the MM State and/or MM Flags information elements if they have been previously set for the persistently stored MM.

Content Type: The type of the MM's content shall always be identified in the MM1_retrieve.RES.

Content: The content of the multimedia message if added by the originator MMS User Agent of the MM may be conveyed in the MM1_retrieve.RES.

Request Status: In case of normal operation the recipient MMS Relay/Server may indicate in the MM1_retrieve.RES that the retrieval of the MM was processed correctly. In case of abnormal operation the recipient MMS Relay/Server shall indicate in the MM1_retrieve.RES the reason why the multimedia message could not be retrieved. The corresponding reason codes should cover application level errors (e.g. "the media format could not be converted", "insufficient credit for retrieval"). Lower layer errors may be handled by corresponding protocols.

The reason code given in the status information element of the MM1_retrieve.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Previously-sent-by: The address(es) of the MMS User Agent(s) that submitted or forwarded the MM prior to the last forwarding MMS User Agent. In the multiple forwarding case the order of the provided addresses shall be indicated and the address of the originator MMS User Agent shall be indicated, if present.

NOTE: The address of the last forwarding MMS User Agent is carried in other addressing elements.

Message Distribution Indication: The VASP may indicate whether the content of the MM is intended for redistribution.

NOTE: From REL-6 onwards, in case of misalignment, DRM-protection rules shall prevail over the Message Distribution Indication feature.

Transaction Identification: The originator MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_retrieve.RES and MM1_acknowledgement.REQ as such.

Applic-ID: This information element contains the identification of the destination application. Upon reception, the recipient MMS User Agent shall provide this MM1_retrieve.RES to the specified destination application.

Reply-Applic-ID: If present, this information indicates a "reply path". It contains the application identifier which shall be used by the recipient MMS User Agent when a reply-MM or a read-reply report is created.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.18.1)

Content Information: The MMS Relay/Server may provide information about the nature of the content in the message. The content information could be in terms of indications that:

- classifies content of the MM based on e.g. media types/formats, size, presentation formats [85]
- the MM contains DRM-protected content

Replace identification: If requested by a VASP in MM7_extended_replace.REQ, the MMS Relay/Server shall provide identification of a previous MM, which is replaced by the MM in the MM1_retrieve.RES..

8.1.5.4 Information Elements

Table 11: Information elements in the MM1_retrieve.REQ

Information element	Presence	Description
Message Reference	Mandatory	Location of the content of the MM to be retrieved.

Table 12: Information elements in the MM1_retrieve.RES

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_retrieve.RES.
Transaction ID	Conditional	If the MMS Relay/Server requests an acknowledgement from the recipient MMS User Agent then the Transaction ID shall be present. It then identifies the MM1_retrieve.RES/MM1_acknowledgement.REQ messages.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message ID	Conditional	The message ID of the MM. Condition: this information element shall be present when the MM1_retrieve.RES contains the requested MM content.
Sender address	Conditional	The address of the MMS User Agent that most recently handled the MM, i.e. that either submitted or forwarded the MM. If the originator MMS User Agent has requested her address to be hidden from the recipient her address shall not be provided to the recipient.
Content type	Mandatory	The content type of the MM's content.
Recipient address	Optional	The address of the MM recipient. Multiple addresses are possible.
Message class	Optional	The class of the message (e.g., personal, advertisement, information service)
Date and time	Mandatory	The time and date of the most recent handling (i.e. either submission or forwarding) of the MM by an MMS User Agent (time stamp).
Delivery report	Conditional	A request for delivery report if a delivery report has been requested by the originator MMS User Agent.
Priority	Conditional	The priority (importance) of the message if specified by the originator MMS User Agent..
Read reply	Conditional	A request for read-reply report if the originator MMS User Agent of the MM has requested a read-reply report.
Subject	Conditional	The title of the whole multimedia message if specified by the originator MMS User Agent of the MM.
MM State	Conditional	The MM State. May be absent for incoming MMs; shall be present for persistently stored MMs
MM Flags	Optional	Present only for persistently stored MMs. One or more keyword flags, which shall be present if they have been previously set for the MM.
Request Status	Optional	The status of the MM retrieve request.
Request Status Text	Optional	Description which qualifies the status of the MM retrieve request.
Reply-Charging	Optional	Information that a reply to this particular original MM is free of charge.
Reply-Charging-ID	Optional	In case of reply-charging this is the identification of the original MM replied to.
Reply-Deadline	Optional	In case of reply-charging the latest time of submission of a reply granted to the recipient (time stamp).
Reply-Charging-Size	Optional	In case of reply-charging the maximum size of a reply-MM granted to the recipient.
Previously-sent-by	Optional	In case of forwarding this information element contains one or more address(es) of MMS User Agent(s) that handled (i.e. forwarded or submitted) the MM prior to the MMS User Agent whose address is contained in the Sender address information element. The order of the addresses provided shall be marked. The address of the originator MMS User Agent shall be marked, if present.
Previously-sent-date-and-time	Optional	The date(s) and time(s) associated with submission and forwarding event(s) prior to the last handling of the MM by an MMS User Agent (time stamp).
Message Distribution Indicator	Optional	If set to "false" the VASP has indicated that content of the MM is not intended for redistribution. If set to "true" the VASP has indicated that content of the MM can be redistributed. (NOTE)
Applic-ID	Optional	Identification of the destination application.
Reply-Applic-ID	Optional	Identification of an application to which reply-MMs and read-reply reports are addressed.

Aux-Applic-Info	Optional	Auxiliary application addressing information.
Content Class	Optional	Classifies the content of the MM to the smallest content class to which the MM belongs [85].
DRM Content	Optional	Indicates if the MM contains DRM-protected content
Replace-ID	Conditional	Identifier of the previous MM that is replaced by the current MM, if requested by a VASP.
Content	Conditional	The content of the multimedia message if specified by the originator MMS User Agent of the MM.
NOTE: From REL-6 onwards, in case of misalignment between the value assigned to MDI and DRM-protection rules, the latter shall prevail.		

Table 13: Information elements in the MM1_acknowledgement.REQ

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_acknowledgment.REQ.
Transaction ID	Conditional	If an acknowledgement is requested by the MMS Relay/Server then the Transaction ID shall be present. It then identifies the MM1_retrieve.RES/MM1_acknowledgement.REQ messages.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Report allowed	Optional	Request to allow or disallow the sending of a delivery report to the MM originator

8.1.6 Forwarding of Multimedia Message

This part of the MMS service describes the mechanism by which a forwarding MMS User Agent can request from the corresponding MMS Relay/Server, that an MM for which the MMS User Agent is the intended recipient (and has been notified of the MM) be forwarded to other specified recipient(s) MMS User Agent(s) whose address(es) shall be specified by the forwarding MMS User Agent, without having to first retrieve the MM. If the MMBox is supported, the MM being forwarded may also be requested to be stored in to the originator's MMBox.

For forwarding purposes an MM forward request shall always be requested by the forwarding MMS User Agent of the forwarding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 14: Abstract messages for forwarding of MM

Abstract messages	Type	Direction
MM1_forward.REQ	Request	MMS UA -> MMS Relay/Server
MM1_forward.RES	Response	MMS Relay/Server -> MMS UA

8.1.6.1 Normal operation

The forwarding MMS User Agent shall issue an MM1_forward.REQ to the forwarding MMS Relay/Server, which contains MMS control information. The MMS Relay/Server shall respond with an MM1_forward.RES, which provides the status of the request.

The MM1_forward.RES shall unambiguously refer to the corresponding MM1_forward.REQ.

Support for MM1_forward.REQ and MM1_forward.RES is mandatory for the MMS Relay/Server that also supports MMBoxes. Otherwise, support for MM1_forward.REQ is optional for the MMS User Agent, and support for MM1_forward.REQ is optional for the MMS Relay/Server..

8.1.6.2 Abnormal Operation

In this case the MMS Relay/Server shall respond with an MM1_forward.RES encapsulating a status which indicates the reason the request for forwarding was not accepted, e.g. no subscription, service not available, invalid content location, message expired, MMBoxes not supported, MMBox not enabled, MMBox over quota, MMBox system full, MMBox I/O error.

When MM1_forward.REQ contains a Store request, the MMS Relay/Server shall provide the results of the store operation in the MM1_forward.RES. If the MMS Relay/Server does not provide the MM1_forward.RES the MMS User Agent should be able to recover.

8.1.6.3 Features

Addressing: One or several recipients of an MM forward request shall be indicated in the addressing-relevant information field(s) of the MM1_forward.REQ. The forwarding MMS User Agent may be indicated in addressing-relevant information field(s) of the MM1_forward.REQ.

Time stamping: The forwarding MMS User Agent may time stamp the MM.

Time constraints: The forwarding MMS User Agent may request an earliest desired time of delivery of the MM. The forwarding MMS User Agent may request a time of expiry for the MM.

Reporting: The forwarding MMS User Agent may request a delivery report for the MM. In addition, the forwarding MMS User Agent may request a read-reply report when the user has viewed the MM.

Reply-Charging: The forwarding MMS User Agent may indicate it wants to pay for a reply-MM and convey the reply-charging limitations (e.g. the latest time of submission and/or the maximum size of a reply-MM) in the MM1_forward.REQ. In this case, forwarding MMS User Agent behaves as the originator MMS User Agent to support reply-charging function. The fowarding MMS User Agent shall not be allowed to forward the reply-charging information set by the originator MMS User Agent.

Identification: The MMS Relay/Server of the forwarding MMS User Agent shall always provide a message identification for an MM forward request, which it has accepted for being forwarded in the MM1_forward.RES.

Persistent storage: If MMBoxes are supported, the presence of the Store information element in MM1_forward.REQ is a request to have a copy of the message being forwarded stored persistently within the forwarder's MMBox. The MM State and/or MM Flags values of the stored MM may be set with the values from the corresponding information elements.

Store Status: The MMS Relay/Server shall indicate the store status of the MM1_forward.REQ in the Store Status information element of the associated MM1_forward.RES. The Store Status information element of the MM1_forward.RES may be supported with an explanatory text. If this text is available in the Store Status Text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Store Status Text information element is at the discretion of the MMS service provider

Message Reference: The forwarding MMS User Agent shall always provide the reference, e.g., URI, for the MM in the MM1_forward.REQ which was provided in MM1_notification.REQ.

Request Status: The MMS Relay/Server of the forwarding MMS User Agent shall indicate the status of the MM1_forward.REQ in the MM1_forward.RES. The reason code given in the status information element of the MM1_forward.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Transaction Identification: The forwarding MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_forward.REQ and MM1_forward.RES as such.

8.1.6.4 Information Elements

Table 15: Information elements in the MM1_forward.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_forward.REQ.
Transaction ID	Mandatory	The identification of the MM1_forward.REQ/MM1_forward.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the forwarding MMS User Agent.
Recipient address	Mandatory	The address of the recipient of the forwarded MM. Multiple addresses are possible.
Forwarding address	Optional	The address of the forwarding MMS User Agent.
Date and time	Optional	The time and date of the forwarding of the MM (time stamp).
Time of Expiry	Optional	The desired time of expiry for the forwarded MM (time stamp).
Earliest delivery time	Optional	The earliest desired time of delivery of the MM to the recipient (time stamp).
Store	Optional	If MMBoxes are supported, the presence of the Store information element in MM1_forward.REQ causes a copy of the MM being forwarded to be stored in the user's MMBox, unless the Message Reference is to an MM already in the MMBox.
MM State	Optional	The value to set in the MM State information element of the stored MM, if Store is present.
MM Flags	Optional	One or more MM Flag keywords to set in the MM Flags information element of the stored MM, if Store is present
Delivery report	Optional	A request for delivery report for the forwarded MM.
Read reply	Optional	A request for read reply report.
Reply-Charging	Optional	A request for reply-charging from the forwarding MMS User Agent which indicate the forwarding user's willingness to pay for the reply-MM from the recipient.
Reply-Deadline	Optional	In case of reply-charging the latest time of submission of replies granted to the recipient(s) (time stamp).
Reply-Charging-Size	Optional	In case of reply-charging the maximum size for reply-MM(s) granted to the recipient(s).
Message Reference	Mandatory	A reference, e.g., URI, for the MM being forwarded. This may either be the Message Reference from MM1_notification.REQ, MM1_mmbox_store.REQ, or MM1_mmbox_view.REQ.

Table 16: Information elements in the MM1_forward.RES.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_forward.RES.
Transaction ID	Mandatory	The identification of the MM1_forward.REQ/MM1_forward.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Request Status	Mandatory	The status of the MM Forward request.
Request Status Text	Optional	Description which qualifies the status of the MM Forward request.
Message ID	Mandatory	The unique identification of the forwarded MM.
Store status	Conditional	The status of the store request, if the Store request was present in MM1_forward.REQ.
Store Status Text	Optional	The explanatory text corresponding to the Store status, if present.
Stored Message Reference	Conditional	The message reference to the newly stored copy of the forwarded MM, if the Store request was present in MM1_forward.REQ and the store operation was successful.

8.1.7 Delivery Report

This part of MMS service covers the sending of delivery report from originator MMS Relay/Server to the originator MMS User Agent. The involved abstract message is outlined in the table below from type and direction points of view.

Table 17: abstract message for sending delivery reports in MMS

Abstract Message	Type	Direction
MM1_delivery_report.REQ	Request	MMS Relay/Server -> MMS UA

8.1.7.1 Normal Operation

The originator MMS Relay/Server shall (subject to user, MMS service provider and/or operator preferences) create the MM1_delivery_report.REQ and send it to the originator MMS User Agent when the appropriate information for the creation of a delivery report is available.

Support for MM1_delivery_report.REQ is optional for the MMS User Agent but mandatory for the MMS Relay/Server.

8.1.7.2 Abnormal Operation

The MMS protocol framework does not provide mechanisms to cover and handle the unsuccessful delivery of MM1_delivery_report.REQ.

The underlying protocols shall provide reliable transport of MM1_delivery_report.REQ. Moreover, underlying protocol layers may provide a mechanism for the MMS User Agent to acknowledge successful reception of a MM1_delivery_report.REQ to the MMS Relay/Server.

8.1.7.3 Features

Identification: In the MM1_delivery_report.REQ the MMS Relay/Server shall always provide the original message identification of the MM that the delivery report corresponds to.

Addressing: The MM recipient address shall be provided to the originator MMS User Agent in the addressing-relevant information field of MM1_delivery_report.REQ.

Time stamping: The MM1_delivery_report.REQ shall carry the time and date of handling of the MM (e.g. retrieval, expiry, rejection).

MM Status: The MM1_delivery_report.REQ shall carry the status of the MM delivery, e.g. retrieved, forwarded, rejected, expired or indeterminate. The status code may be supported with an explanatory text to further qualify the status of the MM delivery (e.g. recipient does not support MMS, recipient address unresolved, MM is too big, if/what content adaptation took place, address where the MM was forwarded).

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_delivery_report.REQ as such.

Applic-ID: This information element indicates the identification of the application that the delivery report is intended for. If a Reply-Applic-ID was indicated in the corresponding original MM, the recipient MMS Relay/Server shall set its value to that Reply-Applic-ID value. Otherwise, the recipient MMS Relay/Server shall set its value to the Applic-ID value that was indicated in the corresponding original MM.

Reply-Applic-ID: If present, this information element indicates a "reply path" to this delivery report, i.e. the identification of an application to which reply-MMs are addressed. The recipient MMS Relay/Server shall insert it into the MM1_delivery_report.REQ if the values of Applic-ID and Reply-Applic-ID in the corresponding original MM differ, in which case its value shall equal the Applic-ID value that was indicated in the corresponding original MM.

Aux-Applic-Info: If present, t his information element indicates additional application/implementation specific control information (cf. 7.1.18.1) . The recipient MMS Relay/Server shall insert it if Aux-Applic-Info was indicated in the corresponding original MM, in which case its value shall equal that Aux-Applic-Info value.

8.1.7.4 Information Elements

Table 18: Information elements in the MM1_delivery_report.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_delivery_report.REQ.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message ID	Mandatory	The identification of the original MM.
Recipient address	Mandatory	The address of the MM recipient of the original MM.
Date and Time	Mandatory	Date and time the MM was handled (retrieved, expired, rejected, etc.) (time stamp)
MM Status	Mandatory	Status of the MM, e.g. retrieved, forwarded, expired, rejected
MM Status text	Optional	Text description of the status for display purposes, should qualify the MM Status
Applic-ID	Optional	The identification of the application that this delivery report is intended for.
Reply-Applic-ID	Optional	Identification of a "reply path" to this delivery report.
Aux-Applic-Info	Optional	Auxiliary application addressing information as indicated in the original MM.

8.1.8 Read-Reply Report

This part of MMS service covers the sending of read-reply report from the recipient MMS User Agent to the recipient MMS Relay/Server and the sending of read-reply report from the originator MMS Relay/Server to the originator MMS User Agent. The involved abstract messages are outlined in the table below from type and direction points of view.

Table 19: Abstract messages for sending and receiving read-reply report in MMS

Abstract messages	Type	Direction
MM1_read_reply_recipient.REQ	Request	MMS UA -> MMS Relay/Server
MM1_read_reply_originator.REQ	Request	MMS Relay/Server -> MMS UA

8.1.8.1 Normal Operation

If a read-reply report is requested for an MM, the recipient MMS User Agent may create the MM1_read_reply_recipient.REQ and send it to the recipient MMS Relay/Server.

The originator MMS Relay/Server shall (subject to user, MMS service provider and/or operator preferences) create the MM1_read_reply_originator.REQ and send it to the originator MMS User Agent when the appropriate information for the creation of a read-reply report is available.

Support for MM1_read_reply_recipient.REQ and MM1_read_reply_originator.REQ is optional for the MMS User Agent but mandatory for the MMS Relay/Server.

8.1.8.2 Abnormal Operation

The MMS protocol framework does not provide mechanisms to cover and handle the unsuccessful delivery of MM1_read_reply_recipient.REQ and MM1_read_reply_originator.REQ.

The underlying protocols shall provide reliable transport of MM1_read_reply_recipient.REQ and MM1_read_reply_originator.REQ. Moreover, underlying protocol layers may provide a mechanism for the MMS Relay/Server to acknowledge successful reception of a MM1_read_reply_recipient.REQ to the MMS User Agent. Underlying protocol layers may also provide a mechanism for the MMS User Agent to acknowledge successful reception of a MM1_read_reply_originator.REQ to the MMS Relay/Server.

8.1.8.3 Features

Identification: In the MM1_read_reply_recipient.REQ the recipient MMS User Agent shall provide the original message identification of the MM that the read-reply report corresponds to. In the MM1_read_reply_originator.REQ the

originator MMS Relay/Server shall provide the original message identification of the MM that the read-reply report corresponds to.

Addressing: The MM originator address shall be provided in the addressing-relevant information field(s) of MM1_read_reply_recipient.REQ. The MM recipient address shall be provided in the addressing-relevant information field(s) of MM1_read_reply_recipient.REQ. Both, the MM recipient and MM originator addresses shall be provided in the addressing-relevant information field(s) of the MM1_read_reply_originator.REQ. If the MM recipient address is not yet provided in the MM1_read_reply_recipient.REQ the MM1_read_reply_originator.REQ shall carry the MM recipient address set by the recipient MMS Relay/Server.

Time stamping: The MM1_read_reply_recipient.REQ may carry the time and date of user handling the MM depending on the status of the MM. The MM1_read_reply_originator.REQ shall carry the time-stamp from the corresponding MM1_read_reply_recipient.REQ if provided. If this time-stamp is not yet provided the MM1_read_reply_originator.REQ shall carry the time-stamp set by the recipient MMS Relay/Server.

Read Status: Both the MM1_read_reply_recipient.REQ and MM1_read_reply_originator.REQ shall carry the status of the MM handling, e.g. read or without being read.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_read_reply_recipient.REQ and MM1_read_reply_originator.REQ as such.

Applic-ID: This information element indicates the identification of the application that the read-reply report is intended for. If a Reply-Applic-ID was indicated in the corresponding original MM, the recipient MMS User Agent shall set its value to that Reply-Applic-ID value. Otherwise, the recipient MMS User Agent shall set its value to the Applic-ID value that was indicated in the corresponding original MM.

Reply-Applic-ID: If present, this information element indicates a "reply path" to this read-reply report, i.e. the identifier of the application to which reply-MMs to this read-reply report are addressed if any.

Aux-Applic-Info: If present, t his information element indicates additional application/implementation specific control information (cf. 7.1.18.1).

8.1.8.4 Information Elements

Table 20: Information elements in the MM1_read_reply_recipient.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_read_reply_recipient.REQ.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Recipient address	Mandatory	The address of the MM recipient of the original MM, i,e, the originator of the read-reply report.
Originator address	Mandatory	The address of the MM originator of the original MM, i,e, the recipient of the read-reply report.
Message ID	Mandatory	The message ID of the original MM.
Date and Time	Optional	Date and time the MM was handled (read, deleted without being read, etc.) (time stamp)
Read Status	Mandatory	Status of the MM, e.g. Read, Deleted without being read
Applic-ID	Optional	The identification of the application that the read-reply report is intended for.
Reply-Applic-ID	Optional	The identification of a "reply path" to this read-reply report.
Aux-Applic-Info	Optional	Auxiliary application addressing information.

Table 21: Information elements in the MM1_read_reply_originator.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_read_reply_originator.REQ.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Recipient address	Mandatory	The address of the MM recipient of the original MM, i,e, the originator of the read-reply report.
Originator address	Mandatory	The address of the MM originator of the original MM, i,e, the recipient of the read-reply report.
Message ID	Mandatory	The message ID of the original MM.
Date and Time	Mandatory	Date and time the MM was handled (read, deleted without being read, etc.) (time stamp)
Read Status	Mandatory	Status of the MM, e.g. Read, Deleted without being read
Applic-ID	Optional	The identification of the application that the read-reply report is intended for.
Reply-Applic-ID	Optional	The identification of a "reply path" to this read-reply report.
Aux-Applic-Info	Optional	Auxiliary application addressing information.

8.1.9 Storing and Updating Multimedia Messages in an MMBox

This section describes the storage of an MM into the user's MMBox. Requests from an MMS User Agent to store MMs will always be sent to the corresponding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 22: Abstract messages for storing or updating stored MMs

Abstract messages	Type	Direction
MM1_mmbox_store.REQ	Request	MMS UA -> MMS Relay/Server
MM1_mmbox_store.RES	Response	MMS UA <- MMS Relay/Server

8.1.9.1 Normal operation

The MMS User Agent shall submit a request to store an MM into the MMBox using the MM1_mmbox_store.REQ, which contains the Message Reference received in the MM1_notification.REQ. In addition, the MMS User Agent shall submit a request to update the MM State and/or MM Flags of an MM already stored within an MMBox using the MM1_mmbox_store.REQ, which contains the Message Reference, MM State and/or MM Flags obtained from any previous operation resulting in an MM being stored or updated in the MMBox.

The MMS Relay/Server shall respond with an MM1_mmbox_store.RES, which provides the status of the store or MM update request. The MM1_mmbox_store.RES shall unambiguously refer to the corresponding MM1_mmbox_store.REQ.

Support for MM1_mmbox_store transactions are optional for the MMS UA and mandatory for the MMS Relay/Server, if MMBoxes are supported.

8.1.9.2 Abnormal Operation

In this case the MMS Relay/Server shall respond with a MM1_mmbox_store.RES containing a status which indicates the reason the multimedia message was not able to be stored or updated, e.g. service not available, MMBoxes not supported, MMBox not enabled, MMBox over quota, MMBox system full, MMBox system I/O error.

If the MMS Relay/Server does not provide the MM1_mmbox_store.RES, the MMS User Agent should assume that the MM was not stored or updated, and should be able to recover.

8.1.9.3 Features

Message Reference: The message reference, in MM1_mmbox_store.REQ, indicates the MM to be stored or updated. This reference can be from MM1_notification.REQ, or the message reference from any of the store request responses (e.g.: MM1_mmbox_store.RES, MM1_mmbox_view.RES, MM1_forward.RES with Store, MM1_submit.RES with Store). The message reference, in MM1_mmbox_store.RES, indicates a reference to the newly stored or updated MM, suitable for subsequent usage.

MM State: The MMS User Agent may request that the MM be stored, or updated, with a specific MM State. In the absence of this value when the Message Reference refers to a new MM (i.e.: from MM1_notification.REQ), the default shall be the New state. In the absence of this value when the Message Reference refers to an MM already stored, the MM State will not be changed.

MM Flags: if present, one or more keyword values. In the absence of this element, no values are assumed for newly stored MMs and no changes made for already stored MMs.

Store Status: The MMS Relay/Server shall indicate the status of the MM1_mmbox_store.REQ in the Store Status information element of the associated MM1_mmbox_store.RES. The Store Status information element of the MM1_mmbox_store.RES may be supported with an explanatory text. If this text is available in the Store Status Text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Store Status text information element is at the discretion of the MMS service provider.

Transaction Identification: The MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_mmbox_store.REQ and MM1_mmbox_store.RES as such.

8.1.9.4 Information Elements

Table 23: Information elements in the MM1_mmbox_store.REQ

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_store.REQ.
Transaction ID	Mandatory	The identification of the MM1_mmbox_store.REQ/MM1_mmbox_store.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Message Reference	Mandatory	The message reference from a MM1_notification.REQ or any previous store or MMBox view operation.
MM State	Optional	The state of the MM. If not present when the Message Reference is from a notification request, defaults to New. No value is assumed when the Message Reference refers to an already stored MM.
MM Flags	Optional	The keyword flags of the MM. There are no defaults.

Table 24: Information elements in the MM1_mmbox_store.RES

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_store.RES.
Transaction ID	Mandatory	The identification of the MM1_mmbox_store.REQ/MM1_mmbox_store.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message reference	Mandatory	A reference to the newly stored or updated MM, suitable for subsequent usage (eg: with MM1_retrieve.REQ and MM1_mmbox_delete.REQ).
Store Status	Mandatory	The status of the MM store operation.
Store Status Text	Optional	Description which qualifies the status of the MM store request.

8.1.10 View the MMBox

This part of the MMS service describes the mechanism by which an MMS User Agent may request a listing of the MMs contained within the subscriber's MMBox. The MMS User Agent shall issue the request to view selected portions of MMs within the subscriber's MMBox, as well as information about the MMBox itself, from the corresponding MMS Relay/Server.

Involved abstract messages are outlined in the table below from type and direction points of view.

Table 25: Abstract messages for viewing the MMBox

Abstract messages	Type	Direction
MM1_mmbox_view.REQ	Request	MMS UA -> MMS Relay/Server
MM1_mmbox_view.RES	Response	MMS UA <- MMS Relay/Server

8.1.10.1 Normal Operations

The MMS User Agent will issue an MM1_mmbox_view.REQ message, containing optional request qualifiers, to the MMS Relay/Server. The MMS Relay/Server will respond with an abstract message, MM1_mmbox_view.RES, containing the original selection parameters and the resulting view data as the content of the abstract message. This information shall consist of a listing of the MMBox contents, possibly including information about the MMBox itself.

When the Start and Limit attributes are used, several pairs of MM1 mmbox_view.REQ and MM1_mmbox_view.RES transactions may be used in order to acquire the complete set of results. The MM1_mmbox_view.RES shall contain the selection parameters that were used to generate the contents of the response, including the Start and Limit attributes, present.

8.1.10.2 Abnormal Operations

In this case the originator MMS Relay/Server shall respond with a MM1_mmbox_view.RES encapsulating a status which indicates the reason the operation could not be completed, e.g. corrupted abstract message, no subscription, service not available, MMBox not supported, MMBox not enabled, MMBox I/O error.

If the MMS Relay/Server does not provide the MM1_mmbox_view.RES the MMS User Agent should be able to recover.

8.1.10.3 Features

Attributes list: A list of information element names that are used in the MM1_mmbox_view.REQ, which request corresponding information elements from the MMs to be conveyed in the MM1_mmbox_view.RES. The list of known information element names are those currently defined for the MM1_retrieve.RES and MM1_notification.REQ. The Content information element may be specified, with the result that content of each MM selected is also returned in the response.

In the absence of the Attributes list information element, the MMS Relay/Server shall, by default and if available, select these information elements from each viewed MM: Message ID, Date and time, Sender address, Subject, Message size, MM State, and MM Flags.

Message Selection: Messages which are to be viewed may be selected by a list of Message References or by a selection based on MM State and/or MM Flags keywords. Either Message Reference List or Select may be supplied in the MM1_mmbox_view.REQ, which selects MMs for inclusion in the content in the MM1_mmbox_view.RES. In the absence of the Message Reference List, if Select is present and if any of the select keywords matches either the MM State or any of the MM flags on an MM in the MMBox, the requested information elements of the MM shall be included in the MM1_mmbox_view.RES (example: "Select: new" or "Select: draft"), along with the Select information element. The absence of both the Message References List and the Select information elements shall yield a listing of all MMs currently stored within the MMBox.

Partial views: MMBox view results may be received in its entirety, or may be indexed to start the view at a given MM offset relative to the selected MMs, and/or may be limited to finite number of MMs to be viewed. The Start information element is a number that may be used in the MM1_mmbox_view.REQ to index the first MM to be viewed, relative to the selected set of MMs, allowing partial views to be requested. If Start is absent, the first selected MM will begin the

view results. The Limit information element is a number that may be provided in the MM1_mmbox_view.REQ to specify a limit for the number of MMs the information elements to which shall be returned in the MM1_mmbox_view.RES. If Limit is absent, all of the remaining MMs shall be returned. If present in the MM1_mmbox_view.REQ, then the Start and Limit information elements are returned in the corresponding MM1_mmbox_view.RES.

MMBox Information: The Totals information element, if present on the request, indicates that the MMBox totals are requested. In the response, the Totals information element value shall be the total number of messages and/or total size, with the units (e.g.: Messages or Bytes) identified. The Quotas information element, if present on the request, indicates that the MMBox quotas, in terms of messages and/or size, are requested. In the response, the Quotas information element value shall be the quotas as the maximum number of messages allowed and/or the maximum size allowed, with the units (e.g.: Messages or Bytes) identified.

MM Listing: a list of information elements from the MMs returned within the MM1_mmbox_view.RES. The listing shall consist of the following information elements, separately grouped for each MM returned in the list:

- Message reference: a unique reference to an MM
- Information elements corresponding to those requested in the Select information element on the MM1_mmbox_view.REQ;

The grouping of information elements from multiple MMs in the the listing shall be accomplished with a consistent encapsulation (e.g., MIME-encapsulation), such that the information elements of each MM shall be clearly distinguished from those of another MM.

Request Status: This will be the status code for any failures of the MM1_mmbox_view.REQ command. The reason code given in the status information element of the MM1_mmbox_view.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Transaction Identification: The MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_mmbox_view.REQ and MM1_mmbox_view.RES as such.

8.1.10.4 Information Elements

Table 26: Information elements in the MM1_mmbox_view.REQ

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_view.REQ.
Transaction ID	Mandatory	The identification of the MM1_mmbox_view.REQ/MM1_mmbox_view.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Attributes list	Optional	A list of information elements that are to be returned as a group for each MM to be listed in the MM1_mmbox_view.RES. If absent, the default list shall apply.
Message Reference list	Optional	One or more Message References which are to have their information elements listed.
Select	Optional	A list of MM State or MM Flags keywords, by which MMs within the MMBox can be selected, if the Message Reference list is absent.
Start	Optional	A number, indicating the index of the first MM of those selected to have information elements returned in the response. If this is absent, the first item selected is returned.
Limit	Optional	A number indicating the maximum number of selected MMs to their information elements returned in the response. If this is absent, information elements from all remaining MMs are returned.
Totals	Optional	Indicates that the current total number of messages and/or size contained by the MMBox are requested
Quotas	Optional	Indicates that the current message and/or size quotas are requested

Table 27: Information elements in the MM1_mmbox_view.RES

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_view.RES.
Transaction ID	Mandatory	The identification of the MM1_mmbox_view.REQ/MM1_mmbox_view.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
MM Listing	Conditional	The requested listing of the selected MMs, which shall be one or more groups of information elements, one for each MM listed. Each clearly separated MM group shall include: a Message Reference, and will include the additional information elements specified by the Attributes as well. If absent, no MMs were found or selected.
Attributes list	Optional	A list of information elements that were specified in the MM1_mmbox_view.RES. If absent, the default list was applied.
Select	Optional	If present, a list of MM State or MM Flags keywords, which selected the MMs returned in this response.
Start	Optional	If present, the numeric index of the first MM of the selected MMs returned in the response.
Limit	Optional	If present, the maximum number of selected MMs from which some or all information elements have been returned in the response. If this is absent, information elements from all remaining MMs are returned.

Request Status	Conditional	If an error occurs, this is a code indicating the exact cause of the error. For successful responses, the Status may be returned with a corresponding success code.
Request Status Text	Optional	If an error occurs, this may contain explanatory text that corresponds to the Request Status.
Totals	Conditional	The total number of messages and/or bytes for the MMBox, identified with Messages or Bytes, respectively, depending upon the presence of Totals in the request.
Quotas	Conditional	The quotas of the MMBox in messages and/or bytes identified with Messages or Bytes, respectively, depending upon the presence of Quotas in the request.

8.1.11 Uploading and Persistently Storing Multimedia Messages

This section describes the uploading and storage of an MM into the subscriber's MMBox. Requests from an MMS User Agent to upload and store MMs in the subscriber's MMBox shall be sent to the corresponding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 28: Abstract messages for uploading and storing MMs

Abstract messages	Type	Direction
MM1_mmbox_upload.REQ	Request	MMS UA -> MMS Relay/Server
MM1_mmbox_upload.RES	Response	MMS UA <- MMS Relay/Server

8.1.11.1 Normal operation

The MMS User Agent shall submit a request to upload and store an MM into the MMBox using the MM1_mmbox_upload.REQ, which contains MMS control information and the MM content.

The MMS Relay/Server shall respond with an MM1_mmbox_upload.RES, which provides the status of the store request. The MM1_mmbox_upload.RES shall unambiguously refer to the corresponding MM1_mmbox_upload.REQ.

Support for MM1_mmbox_upload.REQ is optional for the MMS UA, support for MM1_mmbox_upload.RES is mandatory for the MMS Relay/Server.

8.1.11.2 Abnormal Operation

In this case the MMS Relay/Server shall respond with a MM1_mmbox_upload.RES encapsulating a status which indicates the reason the multimedia message was not accepted, e.g. service not available, MMBoxes not supported, MMBox not enabled, MMBox over quota, MMBox system full, MMBox system I/O error.

If the MMS Relay/Server does not provide the MM1_mmbox_upload.RES the MMS User Agent should assume that the MM was not stored, and should be able to recover.

8.1.11.3 Features

Addressing: One or several MM recipients and the originator of a submitted MM may be indicated in the addressing-relevant information field(s) of the MM1_mmbox_upload.REQ. It is possible for incompletely composed MMs to be stored, which means that the addressing-relevant information fields may be empty.

Time stamping: The originator MMS User Agent may time stamp the MM.

Message class, priority and subject: The MM may be qualified further by adding a message class, priority and/or subject to the MM in the MM1_mmbox_upload.REQ. Additional qualifiers may be added.

Identification: For an MM that has been stored persistently, the MMS Relay/Server shall always provide a message identification in the MM1_mmbox_upload.RES.

MM State: The MMS User Agent may request that the submitted MM be stored with a specific MM State. In the absence of this value, the default shall be the Draft state.

MM Flags: if present, one or more keyword values.

Content Type: The MIME type of the MM shall always be identified.

Content: The content of the MM to be uploaded and stored.

Request Status: The MMS Relay/Server shall indicate the status of the MM1_mmbox_upload.REQ in the associated MM1_mmbox_upload.RES. The reason code given in the status information element of the MM1_mmbox_upload.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Transaction Identification: The MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_mmbox_upload.REQ and MM1_mmbox_upload.RES as such.

8.1.11.4 Information Elements

Table 29: Information elements in the MM1_mmbox_upload.REQ

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_upload.REQ.
Transaction ID	Mandatory	The identification of the MM1_mmbox_upload.REQ/MM1_mmbox_upload.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Recipient address	Optional	The address of the recipient(s).
Sender address	Optional	The address of the MM originator.
Message class	Optional	The class of the MM (e.g., personal, advertisement, information service)
Date and time	Optional	The time and date of the upload of the MM (time stamp).
Time of Expiry	Optional	The desired time of expiry for the MM or reply-MM (time stamp).
Earliest delivery time	Optional	The earliest desired time of delivery of the MM to the recipient (time stamp).
Priority	Optional	The priority (importance) of the message.
MM State	Optional	The state of the MM. Will default to the Draft state if absent.
MM Flags	Optional	The keyword flags of the MM. There are no defaults.
Subject	Optional	The title of the whole multimedia message.
Content type	Mandatory	The content type of the MM's content
Content	Mandatory	The content of the multimedia message

Table 30: Information elements in the MM1_mmbox_upload.RES

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_upload.RES.
Transaction ID	Mandatory	The identification of the MM1_mmbox_upload.REQ/MM1_mmbox_upload.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message reference	Mandatory	A reference to the newly stored MM, suitable for subsequent usage (e.g.: with MM1_retrieve.REQ, MM1_mmbox_delete.REQ, etc.).
Request Status	Mandatory	The status of the MM upload operation.
Request Status Text	Optional	Description which qualifies the status of the MM submit request.

8.1.12 Deletion of Stored Multimedia Messages

This section describes the deletion of one or more Multimedia Messages (MMs) from the subscriber's MMBox. Requests from an MMS User Agent to delete MMs from the subscriber's MMBox will always be sent to the corresponding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 31: Abstract messages for MM deletion in MMS

Abstract messages	Type	Direction
MM1_mmbox_delete.REQ	Request	MMS User Agent -> MMS Relay/Server
MM1_mmbox_delete.RES	Response	MMS User Agent <- MMS Relay/Server

8.1.12.1 Normal Operations

The MMS User Agent may issue an MM1_mmbox_delete.REQ message to the MMS Relay/Server with one or more Message References. The MMS Relay/Server shall perform the requested deletions and return an MM1_mmbox_delete.RES which shall contain a successful response code, or shall contain any error status and optional text.

If multiple Message References are successfully deleted, the response shall contain only a successful Status code and no Message Reference.

Support for MM1_mmbox_delete.REQ is optional for the MMS UA, and mandatory for the MMS Relay/Server, if MMBoxes are supported.

8.1.12.2 Abnormal Operations

In this case the MMS Relay/Server shall respond with a MM1_mmbox_delete.RES encapsulating a status which indicates the reason the multimedia message was not deleted, e.g. corrupted abstract message, invalid message reference, service not available, MMBoxes not supported, MMBox not enabled, MMBox system I/O error.

If the MMS Relay/Server does not provide the MM1_mmbox_delete.RES the MMS User Agent should be able to recover.

When multiple Message References are submitted for deletion and an error occurs, then the Message Reference of each MM in error will be returned with an appropriate error code and text.

8.1.12.3 Features

Message Reference: The message reference indicating the MM to be deleted. Multiple message references may be given, allowing multiple MMs to be deleted within the same transaction.

Request Status: The MMS Relay/Server shall indicate the status of the MM1_mmbox_delete.REQ in the associated MM1_mmbox_delete.RES. The reason code given in the status information element of the MM1_mmbox_delete.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent should bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

Transaction Identification: The MMS User Agent shall provide unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_mmbox_delete.REQ and MM1_mmbox_delete.RES as such.

8.1.12.4 Information Elements

Table 32: Information elements in the MM1_mmbox_delete.REQ

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_delete.REQ.
Transaction ID	Mandatory	The identification of the MM1_mmbox_delete.REQ/MM1_mmbox_delete.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Message Reference	Mandatory	The Message Reference of the message to be deleted; this element may occur multiple times, once for each MM to be deleted.

Table 33: Information elements in the MM1_mmbox_delete.RES

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_mmbox_delete.RES.
Transaction ID	Mandatory	The identification of the MM1_mmbox_delete.REQ/MM1_mmbox_delete.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message Reference	Conditional	A reference to the message in error, if any, to which the following information elements apply. Multiple message references may occur.
Request Status	Mandatory	The status of the MM deletion request; multiple Statuses may occur, each one referring to the immediately preceding Message Reference.
Request Status Text	Optional	Description which qualifies the status of the MM deletion request; multiple Status Text entries may occur, each one corresponding to the immediately preceding Request Status.

8.1.13 Cancelling a Multimedia Message

This part of the MMS service describes the mechanism by which an MMS Relay/Server may request an MMS User Agent, that an MM which the MMS User Agent has already retrieved be cancelled.

For cancelling purposes an MM cancel request shall always be requested by an MMS Relay/Server to an MMS User Agent. Request from a VASP to cancel an MM (in terms of MM7_extended_cancel.REQ) invokes the cancel request in the MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 34: Abstract messages for cancelling an MM

Abstract messages	Type	Direction
MM1_cancel.REQ	Request	MMS Relay/Server -> MMS UA
MM1_cancel.RES	Response	MMS UA -> MMS Relay/Server

8.1.13.1 Normal operation

The MMS Relay/Server shall issue an MM1_cancel.REQ to the MMS User Agent, which contains the identification of the message to be cancelled. The MMS User Agent shall respond with an MM1_cancel.RES.

The MM1_cancel.RES shall unambiguously refer to the corresponding MM1_cancel.REQ.

Support for MM1_cancel.REQ and MM1_cancel.RES is optional for both MMS User Agent and MMS Relay/Server.

8.1.13.2 Abnormal Operation

In this case the MMS User Agent shall respond with an MM1_cancel.RES encapsulating a status which indicates the reason the request for cancelling was not accepted, e.g. the MM is not available, denied by a user.

If the MMS User Agent does not provide the MM1_cancel.RES, the MMS Relay/Server should be able to recover. In this case, the MMS Relay/Server may retransmit the MM1_cancel.REQ to the MMS User Agent.

8.1.13.3 Features

Transaction Identification: The MMS Relay/Server shall provide an unambiguous transaction identification within a request. The response shall unambiguously refer to the corresponding request using the same transaction identification.

Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_cancel.REQ and MM1_cancel.RES as such.

Cancel ID: The MMS Relay/Server shall provide the identification of the original MM to be cancelled in the cancel request.

Request Status: The MMS User Agent may provide the status if the request was successfully received to the MMS Relay/Server in the MM1_cancel.RES.

8.1.13.4 Information Elements

Table 35: Information elements in the MM1_cancel.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_cancel.REQ.
Transaction ID	Mandatory	The identification of the MM1_cancel.REQ/MM1_cancel.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the forwarding MMS Relay/Server.
Cancel ID	Mandatory	Identifies the MM to be cancelled.

Table 36: Information elements in the MM1_cancel.RES.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_cancel.RES.
Transaction ID	Mandatory	The identification of the MM1_cancel.REQ/MM1_cancel.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Request Status	Optional	The status if the MM cancel request was received.

8.1.14 Deletion of Multimedia Messages on an MMS Relay/Server

This part of MMS service covers the deletion of MM(s). It can be used by the MMS User Agent to request the recipient MMS Relay/Server, to delete one or more of its deferred MMs. The deletion request shall always be submitted from the originator MMS User Agent to the corresponding MMS Relay/Server. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 37 Abstract messages for deletion of deferred MMs on MMS Relay/Server

Abstract messages	Type	Direction
MM1_delete.REQ	Request	MMS UA -> MMS Relay/Server
MM1_delete.RES	Response	MMS Relay/Server -> MMS UA

8.1.14.1 Normal operation

The originator MMS User Agent shall request deletion of deferred MMs using the MM1_delete.REQ.

The MMS Relay/Server shall respond with an MM1_delete.RES, which provides the status of the request. The MM1_delete.RES shall unambiguously refer to the corresponding MM1_delete.REQ.

Support for MM1_delete.REQ is optional for the MMS User Agent, support for MM1_delete.RES is optional for the MMS Relay/Server.

8.1.14.2 Abnormal Operation

In this case the originator MMS Relay/Server shall respond with an MM1_delete.RES encapsulating a status which indicates the reason the multimedia message was not deleted, e.g. MM unavailable.

If the MMS Relay/Server does not provide the MM1_delete.RES the MMS User Agent should be able to recover.

8.1.14.3 Features

Message Reference: The recipient MMS Relay/Server shall always provide a reference, e.g., URI, for the deferred MM(s) in the MM1_Delete.REQ.

MMS Version: The MMS protocol shall provide unique means to identify the current version of the particular protocol environment.

Message Type: The type of the message used on the reference point MM1 indicating MM1_ Delete.REQ and MM1_ Delete.RES as such.

Request Status: In case of normal operation the recipient MMS Relay/Server shall indicate in the MM1_ Delete.RES that the deletion of the MM was processed correctly. In case of abnormal operation the recipient MMS Relay/Server shall indicate in the MM1_ Delete.RES the reason why the multimedia message could not be deleted. The corresponding reason codes should cover application level errors (e.g. "MM unavailable").

The reason code given in the status information element of the MM1_ Delete.RES may be supported with an explanatory text further qualifying the status. If this text is available in the Request status text information element the MMS User Agent may bring it to the user's attention. The choice of the language used in the Request status text information element is at the discretion of the MMS service provider.

8.1.14.4 Information Elements

Table 38: Information elements in the MM1_Delete.REQ.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_ Delete.REQ
Transaction ID	Mandatory	The identification of the MM1_ Delete.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS Relay/Server.
Message Reference	Mandatory	The message reference (e.g., URI) of the deferred MM(s) to be deleted; this element occurs at least once, but may occur multiple times. Once for each deferred MM to be deleted.

Table 39: Information elements in the MM1_Delete.RES.

Information element	Presence	Description
Message Type	Mandatory	Identifies this message as MM1_ Delete.RES.
Transaction ID	Mandatory	The identification of the MM1_ Delete.REQ/MM1_ Delete.RES pair.
MMS Version	Mandatory	Identifies the version of the interface supported by the MMS User Agent.
Request Status	Mandatory	The status of the MM1_Delete.REQ; this element occurs at least once, but may occur multiple times. Each one referring to the immediately preceeding Message Reference.
Request Status Text	Optional	Description which qualifies the status of the MM1_Delete.REQ; this element occurs at least once, but may occur multiple times. Each one corresponding to the immediately preceeding Request status.

8.2 Technical realisation of MMS on reference point MM2

This clause may be specified further in future releases.

8.3 Technical realisation of MMS on reference point MM3

This clause defines the interworking between MMS Relay/Servers and External Messaging Servers. The interworking with these External Servers may be based on the Internet Protocol, IP.

Reference point MM3 should be based upon existing standards e.g. HTTP, SMTP. Several examples of realisations can be found in Annex A. In addition, MMS service providers or network operators may develop solutions for their particular needs.

8.3.1 Sending of MMs

For the purpose of sending an MM to an external messaging system the originator MMS Relay/Server should convert the MM into a format appropriate for the external messaging system. This is further elaborated in Annex D1

When converting the MM to the format used by the external messaging system, the MMS Relay/Server should use the information elements associated with the MM and differentiating between those information elements that are needed for the transfer protocol and those elements that should be conveyed as part of the converted message.

E.g., the originator MMS Relay/Server should use the recipient's address(es) as indicated in the corresponding MM to route the converted message towards its recipient(s). In addition to this, it may convey message class, priority and subject of the associated MM as part of the converted message.

8.3.2 Receiving of messages

For the purpose of receiving a message from an external messaging system the recipient MMS Relay/Server should convert incoming messages to the MM format in use by the recipient(s) that form part of the recipient MMS Service Provider's domain.

The recipient MMS Relay/Server may convert control information received from the External Server into appropriate information elements of an MM.

E.g., the recipient MMS Relay/Server should use the MSISDNs associated with an SMS-Short Message to define the sender's and recipient's addresses of the MM. In addition to this, it may e.g. map a priority assigned to an incoming SMS-Short Message to the MM's priority.

8.3.3 Discovery of new messages on External Servers

For discovery of incoming messages from external messaging systems different mechanisms may be utilised, e.g.:

- forwarding of messages from External Server to MMS Relay/Server, based on criteria defined by the user or application;
- notification of messages from an External Server, followed by retrieval by the MMS User Agent via the MMS Relay/Server;
- periodic polling for messages on External Server, followed by retrieval by the MMS User Agent via the MMS Relay/Server.

More detailed specification of these mechanisms should be further elaborated in future versions of the present document.

8.4 Technical realisation of MMS on reference point MM4

An MMSE shall be able to discover a peer MMSE as described in clause 7.2.2. This clause defines the interworking between MMS Relay/Servers once the peer systems are aware of each other being an MMSE.

8.4.1 Routing Forward of a Multimedia Message

This part of MMS service covers the routing forward of an MM from an originator MMS Relay/Server to a recipient MMS Relay/Server of different MMSEs. Involved abstract messages are outlined in the table below from type and direction points of view.

Table 40: Abstract messages for forwarding of MM in MMS

Abstract messages	Type	Direction
MM4_forward.REQ	Request	Originator MMS Relay/Server -> recipient MMS Relay/Server
MM4_forward.RES	Response	Recipient MMS Relay/Server -> originator MMS Relay/Server

8.4.1.1 Normal operation

After successful discovery of its peer entity the originator MMS Relay/Server shall route an MM forward to the recipient MMS Relay/Server using a single or multiple MM4_forward.REQs each containing multiple or single MM recipients, MMS control information and the MM content. The recipient MMS Relay/Server shall respond with a MM4_forward.RES, which provides the status of the request if an MM4_forward.RES was requested. If multiple recipients are addressed in the MM4_Forward.REQ the recipient MMS Relay/Server may respond with any of the following to the originator MMS Relay/Server: a single MM4_Forward.RES message, multiple MM4_Forward.RES messages, or any combination of single or multiple MM4_Forward.RES messages. E.g. this will allow for multiple status indications or a single collective status indication in the MM4_Forward.RES in case of partial addressing failures.

NOTE: Before and including version 6.5.0 of the present document had insufficient mechanisms to convey errors that occurred on multiple recipients to the originator's MMS Relay/Server.

Support for MM4_forward.REQ and MM4_forward.RES is mandatory for the MMS Relay/Server.

8.4.1.2 Abnormal Operation

In this case the recipient MMS Relay/Server shall respond with a MM4_forward.RES, which includes a status that indicates the reason the multimedia message was not accepted, e.g. no subscription, bad address, network not reachable, etc., if an MM4_forward.RES was requested. The MMS Relay/Server should ensure that MM4_Forward.RES messages sent back in response to a MM4_Forward.REQ cover all recipients.

8.4.1.3 Features

Addressing: The recipient(s) of a routed forward MM shall be indicated in the addressing-relevant information field(s) of the MM4_forward.REQ. If the addresses of several MM recipients of the MM are associated with a single MMS

Relay/Server then more than one MM recipient may be indicated in the addressing-relevant information field(s) of the MM4_forward.REQ. Addresses of all MM recipients of the MM (including those that are not associated with the MMS Relay/Server the MM is forwarded to) shall be conveyed in the MM4_forward.REQ for the MM recipient's informational purposes.

The MM originator of a routed forward MM shall be indicated in addressing-relevant information field(s) of the MM4_forward.REQ. If the originator MMS User Agent requested to hide its identity from the MM recipient then the information about this request shall also be conveyed in the MM4_forward.REQ.

Time stamping: The MM4_forward.REQ shall carry the date and time-of the most recent handling of the MM by an MMS User Agent (i.e. either submission or forwarding of the MM). In the case of forwarding the MM4_forward.REQ may carry the date and time of the submission of the MM.

Time constraints: If the originator MMS User Agent requested a time of expiry for the MM then this information shall be conveyed in the MM4_forward.REQ.

Message class, priority and subject: If the MM is qualified further by message class, priority, subject and/or additional qualifiers then this information shall be conveyed in the MM4_forward.REQ.

Reporting: If either the originator MMS User Agent, or the originator MMS Relay/Server requested a delivery report for the MM then the information about this request shall be conveyed in the MM4_forward.REQ. If, in addition, the originator MMS User Agent requested a read-reply report then the information about this request shall be conveyed in the MM4_forward.REQ.

Identification: The originator MMS Relay/Server shall always provide a unique message identification for an MM, which it routed forward to a peer MMS Relay/Server in the MM4_forward.REQ.

Content Type: The type of the multimedia content shall always be identified in the MM4_forward.REQ.

Acknowledgement Request: The originator MMS Relay/Server may request a MM4_forward.RES from the recipient MMS Relay/Server acknowledging the successful reception of the MM.

Request Status: The recipient MMS Relay/Server shall indicate the status of the MM4_forward.REQ in the associated MM4_forward.RES if requested.

Request Recipients: A list of recipients to whom the request status applies.

Message Type: The type of message used on reference point MM4 indicating MM4_forward.REQ and MM4_forward.RES as such.

Transaction Identification: If the originator MMS Relay/Server requests an MM4_forward.RES from the recipient MMS Relay/Server it shall provide a transaction identification within an MM4_forward.REQ. The MM4_forward.RES shall unambiguously refer to the corresponding MM4_forward.REQ using the same transaction identification.

Forward_Counter: A Counter indicating the number of times the particular MM was forwarded by a forwarding MMS User Agent.

Previously-sent-by: The address(es) of the MMS User Agent(s) that submitted or forwarded the MM prior to the last forwarding MMS User Agent. In the multiple forwarding case the order of the provided addresses shall be indicated and the address of the originator MMS User Agent shall be marked, if present.

NOTE: The address of the last forwarding MMS User Agent is carried in other addressing elements.

Version: The MMS protocol shall provide unique means to identify the current version in the particular protocol environment.

Content adaptation restriction: The originator may request that the content of the MM will not be subjected to content adaptation.

Content Information: The originator may provide information about the nature of the content in the message. The content information could be in terms of indications that:

- classifies content of the MM based on e.g. media types/formats, size, presentation formats [85]
- the MM contains DRM-protected content

In case of conflict with the adaptation restriction provided by the originator, DRM-protection rules in content adaptation shall prevail over the adaptation restriction.

Applic-ID: This information element specifies the identification of the application that the routed forward MM is intended for. Its value shall equal the Applic-ID value of the MM which is being routed forward with this MM4_forward.REQ.

Reply-Applic-ID: If present, this information element indicates a "reply path" to this MM, i.e. the identifier of the application to which a destination application shall address reply-MMs if any. The Reply-Applic-ID value shall equal the Reply-Applic-ID value of the MM which is being routed forward with this MM4_forward.REQ.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.18.1). The Aux-Applic-Info value shall equal the Aux-Applic-Info value of the MM which is being routed forward with this MM4_forward.REQ. **Applic-ID:** This information element specifies the identification of the application that the routed forward MM is intended for. Its value shall equal the Applic-ID value of the MM which is being routed forward with this MM4_forward.REQ.

Reply-Applic-ID: If present, this information element indicates a "reply path" to this MM, i.e. the identifier of the application to which a destination application shall address reply-MMs if any. The Reply-Applic-ID value shall equal the Reply-Applic-ID value of the MM which is being routed forward with this MM4_forward.REQ.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.17.1). The Aux-Applic-Info value shall equal the Aux-Applic-Info value of the MM which is being routed forward with this MM4_forward.REQ.

Originator-Sytem-Address: This information element contains the Address of the origination MMS Relay/Server. This address shall be used by the recipient MMS Relay/Server to return the MM4_forward.RES if requested by the originating MMS Relay/Server. This information shall be present if the Acknowledgement Request information element is present in the MM4_forward.REQ.

8.4.1.4 Information Elements

Table 41: Information elements in the MM4_forward.REQ.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the originator MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: "MM4_forward.REQ".
Transaction ID	Mandatory	The identification of the MM4_forward.REQ/ MM4_forward.RES pair.
Message ID	Mandatory	The identification of the MM.
Recipient(s) address	Mandatory	The address(es) of the MM recipient(s). Multiple addresses are possible.
Sender address	Mandatory	The address of the MMS User Agent that most recently handled the MM, i.e. that either submitted or forwarded the MM. If the originator MMS User Agent has requested her address to be hidden from the recipient her address shall not be provided to the recipient.
Content type	Mandatory	The content type of the MM's content.
Message class	Conditional	The class of the MM (e.g., personal, advertisement, information service) if specified by the originator MMS User Agent
Date and time	Mandatory	The time and date of the most recent handling (i.e. either submission or forwarding) of the MM by an MMS User Agent (time stamp).
Time of Expiry	Conditional	The desired time of expiry for the MM if specified by the originator MMS User Agent (time stamp).
Delivery report	Conditional	A request for delivery report if the originator MMS User Agent has requested a delivery report for the MM.
Originator R/S delivery report	Conditional	A request for delivery report that, when set to "Yes", means the originator MMS Relay/Server has requested a delivery report for the MM. Interpret as "No" in the absence of this Information element.
Priority	Conditional	The priority (importance) of the message if specified by the originator MMS User Agent.
Sender visibility	Conditional	A request to show or hide the sender's identity when the message is delivered to the MM recipient if the originator MMS User Agent has requested her address to be hidden from the recipient.
Read reply	Conditional	A request for read reply report if the originator MMS User Agent has requested a read-reply report for the MM..
Subject	Conditional	The title of the whole MM if specified by the originator MMS User Agent.
Acknowledgement Request	Optional	Request for MM4_forward.RES
Forward_counter	Conditional	A counter indicating the number of times the particular MM was forwarded by a forwarding MMS User Agent.
Previously-sent-by	Optional	In case of forwarding this information element contains one or more address(es) of MMS User Agent(s) that handled (i.e. forwarded or submitted) the MM prior to the MMS User Agent whose address is contained in the Sender address information element. The order of the addresses provided shall be marked. The address of the originator MMS User Agent shall be marked, if present.
Previously-sent-date-and-time	Optional	The date(s) and time(s) associated with submission and forwarding event(s) prior to the last handling of the MM by an MMS User Agent (time stamps).
Applic-ID	Optional	Identification of the destination application.
Reply-Applic-ID	Optional	Identification of a "reply-path" to this MM.
Aux-Applic-Info	Optional	Auxiliary application addressing information.
Content Class	Optional	Classifies the content of the MM to the smallest content class to which the message belongs [85]
DRM Content	Optional	Indicates if the MM contains DRM-protected content
Adaptations	Optional	Indicates if the originator allows adaptation of the content (default True)
Originator-Sytem-Address	Conditional	This information element indicates the Address of the

		origination MMS Relay/Server. This information shall be present if the Acknowledgement Request information element is present in the MM4_forward.REQ.
Content	Conditional	The unaltered content of the multimedia message if specified by the originator MMS User Agent.

Table 42: Information elements in the MM4_forward.RES.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the recipient MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: "MM4_forward.RES".
Transaction ID	Mandatory	The identification of the MM4_forward.REQ/ MM4_forward.RES pair.
Message ID	Mandatory	The Message ID of the MM which has been forwarded within the corresponding MM4_forward.REQ
Request Recipients	Conditional	List of recipients to whom the Request Status value applies. If this element is absent the Request Status value is applicable to all recipients of the corresponding MM4_forward.REQ
Request Status	Mandatory	The status of the request to route forward the MM.
Request Status text	Optional	Status text corresponding to the Request Status

8.4.2 Routing Forward of a Delivery Report

This part of MMS service covers the routing forward of a delivery report from recipient MMS Relay/Server to originator MMS Relay/Server. The involved abstract messages are outlined in the table below from type and direction points of view.

Table 43: Abstract messages for routing delivery reports forward in MMS

Abstract Message	Type	Direction
MM4_delivery_report.REQ	Request	Recipient MMS Relay/Server -> originator MMS Relay/Server
MM4_delivery_report.RES	Response	Originator MMS Relay/Server -> recipient MMS Relay/Server

8.4.2.1 Normal Operation

After successful discovery of its peer entity the recipient MMS Relay/Server shall route a previously created delivery report forward to the originator MMS Relay/Server using the MM4_delivery_report.REQ which contains MMS control information only. The originator MMS Relay/Server shall respond with a MM4_delivery_report.RES, which provides the status of the MM4_delivery_report.REQ if an MM4_delivery_report.RES was requested.

Support for MM4_delivery_report.REQ and MM4_delivery_report.RES is mandatory for the MMS Relay/Server.

8.4.2.2 Abnormal Operation

In this case the originator MMS Relay/Server shall respond with a MM4_delivery_report.RES encapsulating a status which indicates the reason the delivery report was not accepted, if an MM4_delivery_report.RES was requested.

8.4.2.3 Features

Addressing: Both the address of the recipient (which is the MM originator) and the address of the originator (which is the MM recipient) of a routed forward delivery report shall be provided to the originator MMS Relay/Server in the addressing-relevant information field of MM4_delivery_report.REQ.

Identification: In the MM4_delivery_report.REQ the recipient MMS Relay/Server shall always provide the original message identification of the MM that the delivery report corresponds to as obtained from the associated MM4_forward.req.

MM Time stamping: The MM4_delivery_report.REQ shall carry the time and date of handling of the MM (e.g. retrieval, expiry, rejection).

MM Status: The MM4_delivery_report.REQ shall carry the status of the MM delivery, e.g. retrieved, rejected, expired or indeterminate. The MM Status Extension may be used to provide more granularity. The status code may be supported with an explanatory text to further qualify the status of the MM delivery (e.g. recipient does not support MMS, recipient address unresolved, MM is too big, if/what content adaptation took place, address where the MM was forwarded).

Acknowledgement Request: The recipient MMS Relay/Server may request a MM4_delivery_report.RES from the originator MMS Relay/Server acknowledging the successful reception of the delivery report.

Forward To originator UA: The recipient MMS Relay/Server shall indicate if the originator MMS Relay/Server is allowed to forward the Delivery Report to the originator MMS User Agent.

Request Status: The originator MMS Relay/Server shall indicate the status of the MM4_delivery_report.REQ in the associated MM4_delivery_report.RES if requested.

Version: The MMS protocol shall provide unique means to identify the current version in the particular protocol environment.

Message Type: The type of message used on reference point MM4 indicating MM4_delivery_report.REQ and MM4_delivery_report.RES as such.

Transaction Identification: If the originator MMS Relay/Server requests an MM4_delivery_report.RES from the recipient MMS Relay/Server it shall provide a transaction identification within an MM4_delivery_report.REQ. The MM4_delivery_report.RES shall unambiguously refer to the corresponding MM4_delivery_report.REQ using the same transaction identification.

Applic-ID: This information element indicates the identification of the application that the delivery report is intended for. The recipient MMS Relay/Server shall insert this Applic-ID in a MM4_delivery_report.REQ if an Applic-ID was present in the corresponding original MM. If a Reply-Applic-ID was indicated in the corresponding original MM, the Applic-ID value shall equal that Reply-Applic-ID value. Otherwise, its value shall equal the Applic-ID value that was indicated in the corresponding original MM.

Reply-Applic-ID: If present, this information element indicates the application that the original MM was delivered to. The recipient MMS Relay/Server shall insert this Reply-Applic-ID if the values of Applic-ID and Reply-Applic-ID in the corresponding original MM differ. Its value shall equal the Applic-ID value that was indicated in the corresponding original MM.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.18.1). The recipient MMS Relay/Server shall insert this Aux-Applic-Info if Aux-Applic-Info was present in the corresponding original MM. Its value shall equal the Aux-Applic-Info value that was indicated in the corresponding original MM.

8.4.2.4 Information Elements

Table 44: Information elements in the MM4_delivery_report.REQ.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the recipient MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: " MM4_delivery_report.REQ".
Transaction ID	Mandatory	The identification of the MM4_delivery_report.REQ/ MM4_delivery_report.RES pair.
Message ID	Mandatory	The identification of the original MM.
Recipient address	Mandatory	The address of the MM recipient of the original MM.
Sender address	Mandatory	The address of the MM originator of the original MM.
Date and time	Mandatory	Date and time the MM was handled (retrieved, expired, rejected, etc.) (time stamp).
Acknowledgement Request	Optional	Request for MM4_delivery_report.RES
Forward to Originator UA	Optional	If "No", indicates that the originator MMS Relay/Server shall not forward the Delivery Report to the originator MMS User Agent. The value "No" is only used when the recipient User Agent refuses a delivery report or when the originator User Agent has not requested a delivery report. Interpret as "Yes" in the absence of this Information element.
MM Status	Mandatory	Status of the MM, e.g. retrieved, expired, rejected
MM Status Extension	Optional	Extension of the MM Status, to provide more granularity.
MM Status text	Optional	Text description of the status for display purposes, should qualify the MM Status
Applic-ID	Optional	The identification of the originating application of the original MM.
Reply-Applic-ID	Optional	The identification of the destination application of the original MM.
Aux-Applic-Info	Optional	Auxiliary application addressing information as indicated in the original MM.

Table 45: Information elements in the MM4_delivery_report.RES.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the recipient MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: "MM4_delivery_report.RES".
Transaction ID	Mandatory	The identification of the MM4_delivery_report.REQ/ MM4_delivery_report.RES pair.
Message ID	Mandatory	The Message ID of the MM which caused the delivery report
Request Status	Mandatory	The status of the associated MM4_delivery_report.REQ.
Request Status text	Optional	The text explanation corresponding to the Request Status

8.4.3 Routing Forward of a Read-Reply Report

This part of MMS service covers the routing forward of a read-reply report from the recipient MMS Relay/Server to the originator MMS Relay/Server. The involved abstract messages are outlined in the table below from type and direction points of view.

Table 46: Abstract messages for sending and receiving read-reply reports in MMS

Abstract messages	Type	Direction
MM4_read_reply_report. REQ	Request	Recipient MMS Relay/Server -> originator MMS Relay/Server
MM4_read_reply_report. RES	Response	Originator MMS Relay/Server -> recipient MMS Relay/Server

8.4.3.1 Normal Operation

After successful discovery of its peer entity the recipient MMS Relay/Server shall route a read-reply report forward, that has been previously submitted by the recipient MMS User Agent, to the originator MMS Relay/Server using the MM4_read_reply_report.REQ which contains MMS control information only. The recipient MMS Relay/Server shall respond with a MM4_read_reply_report.RES, which provides the status of the MM4_read_reply_report.REQ if an MM4_read_reply_report.RES was requested.

Support for MM4_read_reply_report.REQ and MM4_read_reply_report.RES is mandatory for the MMS Relay/Server.

8.4.3.2 Abnormal Operation

In this case the originator MMS Relay/Server shall respond with a MM4_read_reply_report.RES encapsulating a status which indicates the reason the read-reply report was not accepted, if an MM4_read_reply_report.RES was requested.

8.4.3.3 Features

Addressing: Both, the address of the recipient (which is the MM originator) and the address of the originator (which is the MM recipient) of a routed forward read-reply report shall be provided to the originator MMS Relay/Server in the addressing-relevant information field of MM4_read_reply_report.REQ.

Identification: In the MM4_read_reply_report.REQ the recipient MMS Relay/Server shall always provide the original message identification of the MM that the read-reply report corresponds to as obtained from the associated MM4_forward.req.

MM Time Stamping: The MM4_read_reply_report.REQ shall carry the time-stamp associated with the read-reply report**.**

Read Status: The MM4_read_reply_report.REQ shall carry the status of the MM handling, e.g. read or without being read.

Acknowledgement Request: The recipient MMS Relay/Server may request a MM4_read_reply_report.RES from the originator MMS Relay/Server acknowledging the successful reception of the read-reply report.

Request Status: The originator MMS Relay/Server shall indicate the status of the MM4_read_reply_report.REQ in the associated MM4_read_reply_report.RES if requested.

Version: The MMS protocol shall provide unique means to identify the current version in the particular protocol environment.

Message Type: The type of message used on reference point MM4 indicating MM4_read_reply_report.REQ and MM4_read_reply_report.RES as such.

Transaction Identification: If the originator MMS Relay/Server requests an MM4_read_reply_report.RES from the recipient MMS Relay/Server it shall provide a transaction identification within an MM4_read_reply_report.REQ. The MM4_read_reply_report.RES shall unambiguously refer to the corresponding MM4_read_reply_report.REQ using the same transaction identification.

Applic-ID: This information element indicates the identification of the application that the read-reply report is intended for. If a Applic-ID was indicated in the corresponding MM1_read_reply_recipient.REQ, the Applic-ID value shall equal that Applic-ID value.

Reply-Applic-ID: If present, this information element indicates the application that the original MM was delivered to. If a Reply-Applic-ID was present in the corresponding MM1_read_reply_recipient.REQ, the Reply-Applic-ID value shall equal that Reply-Applic-ID value.

Aux-Applic-Info: If present, this information element indicates additional application/implementation specific control information (cf. 7.1.18.1). It shall be present if Aux-Applic-Info was indicated in the corresponding MM1_read_reply_recipient.REQ, in which case its value shall equal the Aux-Applic-Info value that was indicated in the corresponding original MM.

8.4.3.4 Information Elements

Table 47: Information elements in the MM4_read_reply_report.REQ.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the recipient MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: "MM4_read_reply_report.REQ".
Transaction ID	Mandatory	The identification of the MM4_read_reply_report.REQ/ MM4_read_reply_report.RES pair.
Recipient address	Mandatory	The address of the MM recipient of the original MM, i.e. the originator of the read-reply report.
Sender address	Mandatory	The address of the MM originator of the original MM, i.e. the recipient of the read-reply report.
Message ID	Mandatory	The message ID of the original MM.
Date and time	Mandatory	Date and time the MM was handled (read, deleted without being read, etc.) (time stamp)
Acknowledgement Request	Optional	Request for MM4_read_reply_report.RES
Read Status	Mandatory	Status of the MM, e.g. Read, Deleted without being read
Read Status text	Optional	The text explanation corresponding to the Read Status
Applic-ID	Optional	The identification of the originating application of the original MM.
Reply-Applic-ID	Optional	The identification of the destination application of the original MM.
Aux-Applic-Info	Optional	Auxiliary application addressing information.

Table 48: Information elements in the MM4_read_reply_report.RES.

Information element	Presence	Description
3GPP MMS Version	Mandatory	The MMS version of the recipient MMS Relay/Server as defined by the present document.
Message Type	Mandatory	The type of message used on reference point MM4: "MM4_read_reply_report.RES".
Transaction ID	Mandatory	The identification of the MM4_read_reply_report.REQ/ MM4_read_reply_report.RES pair.
Request Status	Mandatory	The status of the associated MM4_read_reply_report.REQ.
Request Status text	Optional	The textual explanation for the Request Status

8.4.4 Message format on MM4

All elements of an MM shall be included within a single SMTP "mail" message which shall be organised as MIME message with the appropriate 'Content-Type' [44] header field value (e.g. multipart/related, multipart/mixed, image/jpeg, text/plain). All MM elements shall be of standard MIME content types. In addition to the MM elements this SMTP "mail" message should reflect all MMS information elements according to the definitions in clauses 6 and 8.4.

All other MMS-related messages, such as delivery reports, read-reply reports, transfer acknowledgements shall each be transferred as a single SMTP "mail" message which shall be organised as MIME type text/plain. This SMTP "mail" message should reflect all MMS information elements as defined above.

8.4.4.1 Message header fields

MMS information elements should be reflected as "header fields" according to STD 11 [5] in the SMTP "mail" message. See RFC 1327 [53] for a detailed description of the X.400 header to STD 11 headers mappings. Some of the mappings are context dependent.