Multimedia Messaging Service Architecture Overview

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Open Mobile Alliance

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Continues the Technical Activities Originated in the WAP Forum

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1. Scope

The Wireless Application Protocol (WAP) is a result of continuous work, provided by the WAP Forum originally and succeeded by the Open Mobile Alliance™ (OMA), to define an industry-wide specification for developing applications that operate over wireless communication networks. The scope for the OMA is to define a set of specifications to be used by service applications. The wireless market is growing very quickly, and reaching new customers and services. To enable operators and manufacturers to meet the challenges in advanced services, differentiation and fast/flexible service creation, the OMA defines a set of protocols in transport, security, transaction, session and application layers. For additional information on the WAP/OMA architecture, please refer to "*Wireless Application Protocol Architecture Specification"* [WAPARCH].

Multimedia Messaging Service (MMS) is a system application by which a client is able to provide a messaging operation with a variety of media types. The service is described in terms of actions taken by the MMS Client and its service partner, the MMS Proxy-Relay, a device which operates as a WAP Origin Server for this specialised service. Additional service aspects are supported by the MMS Server as well as other messaging servers, such as an email server and wireless messaging systems (e.g. SMSC). This specification defines application-level protocol activities that take place to realise the MMS service within the OMA environment.

This document is part of the OMA MMS version 1.1 specification suite and complies with the requirements and service behaviours described in the technical specifications of the 3rd Generation Partnership Project (3GPP). These include the service aspects of MMS and the functional description of MMS which are contained in [TS23140].

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2. References

2.1 Normative References

None; this is an informative document.

2.2 Informative References

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[WAPWAE] "Wireless Application Environment Overview", WAP-190-WAE, WAP Forum. URI: http://www.openmobilealliance.org

[WIM] "Wireless Application Protocol, Wireless Identity Module", WAP-260-WIM, WAP Forum. URI:

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http://www.openmobilealliance.org/

[WML] "Wireless Markup Language Specification", WAP-155-WML, WAP Forum. URI: http://www.openmobilealliance.org/

[WP-TLS] "Wireless Application Protocol, TLS Profile and Tunneling", WAP-219-TLS, WAP Forum. URL: http://www.openmobilealliance.org/

[WSP] "Wireless Application Protocol, Wireless Session Protocol Specification", WAP-230-WSP, WAP Forum. URL: http://www.openmobilealliance.org

[WTLS] "Wireless Application Protocol, Wireless Transport Layer Security Specification", WAP-261-WTLS, WAP Forum. URL: http://www.openmobilealliance.org/

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3. Terminology and Conventions

3.1 Conventions

This document is informative and does not contain any requirements.

3.2 Definitions

This section introduces a terminology that will be used throughout this document.

Email Server

A generic class of servers that nominally hosts email services that operate using the SMTP, POP and/or IMAP protocols.

Multimedia Messaging Service (MMS)

A system application by which a WAP client is able to provide a messaging operation with a variety of media types.

MMS Client

The MMS service endpoint located on the WAP client device.

MMS Proxy-Relay

A server which provides access to various messaging systems. It may operate as a WAP origin server in which case it may be able to utilise features of the WAP system.

MMS Server

A server that provides storage services and operational support for the MMS service.

3.3 Abbreviations

CDR	Charging Data Record
Email	Electronic mail
ESMTP	Extended Simple Mail Transfer Protocol
HTTP	HyperText Transfer Protocol, for details see [RFC2616]
IMAP	Internet Message Access Protocol, for details see [RFC2060]
ISDN	Integrated Services Digital Network
MIME	Multipurpose Internet Mail Extensions
MM	Multimedia Message
MMS	Multimedia Messaging Service
MSISDN	Mobile Station ISDN Number
PEP	Performance Enhancing Proxy
PKI	Public Key Infrastructure, for details see [PKI]
POP	Post Office Protocol, for details see [RFC1939]
SMIL	Synchronized Multimedia Integration Language
S/MIME	Secure/Multipurpose Internet Mail Extensions
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol, for details see [RFC821]

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TLS	Transport Layer Security, for details see [WP-TLS]
WAP	Wireless Application Protocol
WIM	WAP Identity Module, for details see [WIM]
WML	Wireless Markup Language
WSP	Wireless Session Protocol, for details see [WSP]
OMA	Open Mobile Alliance™

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4. Introduction

The Multimedia Messaging Service (MMS), as its name implies, is intended to provide a rich set of content to subscribers in a messaging context. It supports both sending and receiving of such messages by properly enabled client devices. An example of such a message is shown in Figure 1 below.

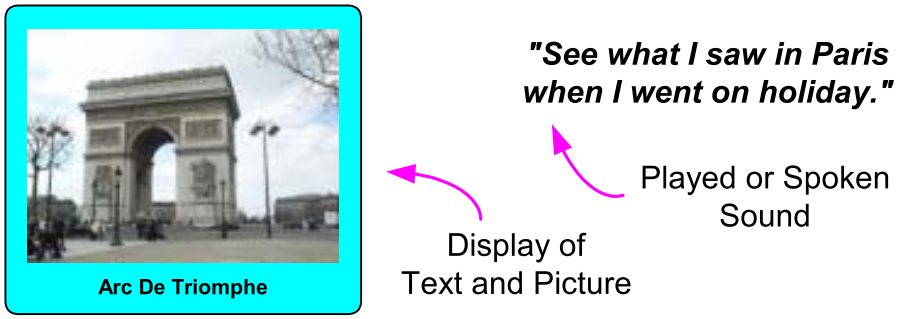

Figure 1 Example Message with Multimedia Content

The Multimedia Messaging Service is viewed as a non-real-time delivery system. This is comparable to many messaging systems in use today. Prime examples include traditional email available on the Internet and wireless messaging systems such as paging or SMS. These services provide a store-and-forward usage paradigm and it is expected that the MMS will be able to interoperate with such systems.

Real-time messaging also exists in various forms. For example, instant messaging available from various vendors or various chat services (e.g. text, voice) are becoming popular. Such services are not currently supported with the MMS system but may be considered for future releases.

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5. MMS Messaging Framework

A key feature of MMS is the ability to support messaging activities with other available messaging systems. This is shown in Figure 2 below which shows an abstract view of an MMS network diagram. It is expected that specific MMS networks may have one or more such connections as well as include specific messaging services not directly represented (e.g. fax or voice mail systems).

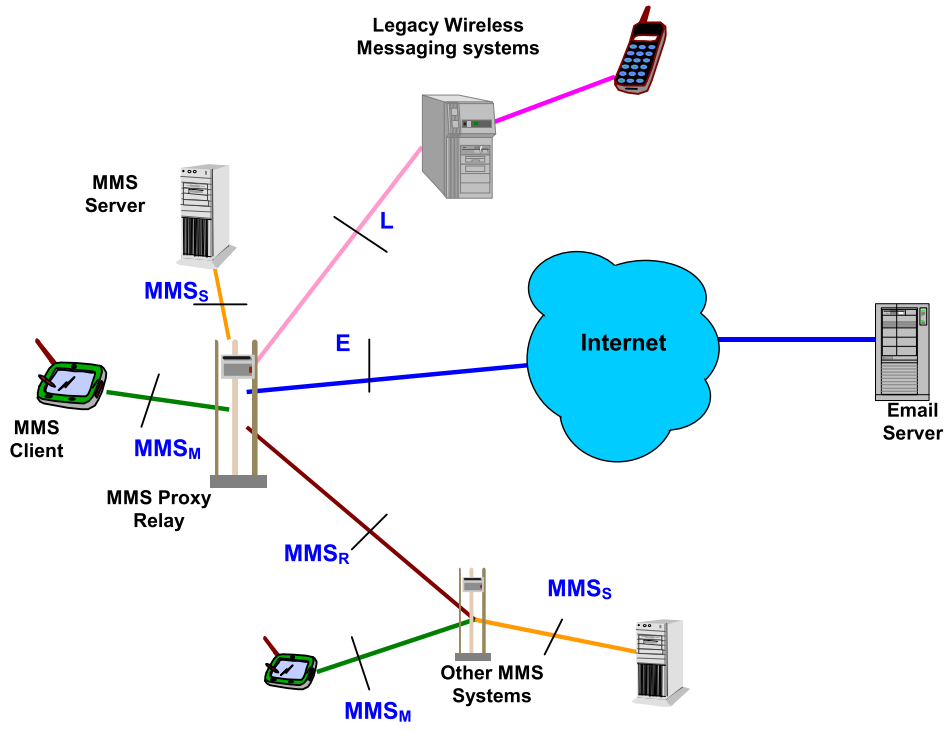

Figure 2 MMS Network Representation

Note that although Figure 2 identifies various interfaces, in some cases, their definition will be for further study. The mention of these interfaces in this document does not imply that the OMA will develop the specifications necessary to describe them in detail.

The system elements shown in Figure 2 can be summarised as follows:

- **MMS Client** – This is the system element that interacts with the user. It is expected to be implemented as an application on the user's wireless device.
- **MMS Proxy-Relay** – This is the system element that the MMS Client interacts with. It provides access to the components that provide message storage services, and it is responsible for messaging activities with other available messaging systems. Some implementations may combine this component with the MMS Server.

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- **MMS Server** – This system element provides storage services for MM messages. Some implementations may combine this component with the MMS Proxy-Relay.
- **Email Server** – This system element provides traditional Internet email services. It supports the SMTP protocol to send messages as well as POP and/or IMAP protocols to retrieve messages.
- **Legacy Wireless Messaging Systems** – This system element represents various systems that currently exist in support of wireless messaging systems. This would include paging and SMS systems that provide messaging to a large number of subscribers.

The interfaces shown in the diagram are described as follows:

- **MMS_m** – the interface defined between the MMS Client and the MMS Proxy-Relay, see section 6, [MMSCTR] and [MMSENCAPS].
- **MMS_S** - the interface defined between the MMS Server and the MMS Proxy-Relay. This interface may be transcendental when the MMS Server and MMS Proxy-Relay are combined into a single component. The need to define this interface has not yet been established.
- **MMS_R** - the interface defined between MMS Proxy-Relays of separate MMS Systems, see section 8. Currently, there is no OMA specification that defines this interface. [TS23140] defines a reference point called MM4, which may be used to implement MMS_R.
- **E** - the standard email interface used between the MMS Proxy-Relay and internet-based email systems utilising SMTP, POP and IMAP transport protocols, see section 7. Currently, there is no OMA specification that defines this interface. This interface may be standardised in the future by the OMA or by some other standardisation body.
- **L** - the interfaces used between the MMS Proxy-Relay and legacy wireless messaging systems. As there are various such systems, this is viewed as being a set of interfaces. This interface may be standardised in the future by the OMA or by some other standardisation body.

5.1 Example Use Case

The following example information flow for a use case is provided to further illustrate the functions and roles of the various system elements in the MMS framework. The example given here concerns end-to-end MMS messaging between terminals.

1. User activates MMS Client (assumed to be available on terminal).
2. User selects or enters MM target address(es).
3. User composes/edits MM to be sent.
4. User requests that MM is sent.
5. MMS Client submits the message to its associated MMS Proxy-Relay via the MMS_M interface.
6. MMS Proxy-Relay resolves the MM target address(es).
7. MMS Proxy-Relay routes forward the MM to each target MMS Proxy-Relay via the MMS_R interface.
8. The MM is stored by the MMS Server associated with the target MMS Proxy-Relay.
9. Target MMS Proxy-Relay sends a notification to target MMS Client via the MMS_M interface.
10. Target MMS Client retrieves the MM from the MMS Server.
11. Target MMS Client notifies target user of new MM available.
12. Target user requests rendering of received MM.
13. Target MMS Client renders MM on target user's terminal.

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Note that steps 1-3 and 12-13 concern the User Interface on the terminal which is considered implementation dependent and therefore outside the scope of this specification. Also note that steps 10 and 11 could occur in reverse order depending on MMS Client implementation, that is, an MM retrieval policy could cause the MMS Client to retrieve an MM only when so allowed by the user.

The above use case, as well as many others, is supported by MMS. The MMS features and functions described in the subsequent sections include:

- The MMS_M, E, and MMS_R interfaces. See sections 6, 7 and 8.
- The MMS client-side structure, which is involved during MM composition, sending, receiving, presentation and rendering. See section 9.
- MMS addressing aspects, which have implications for all the MMS defined interfaces and system elements in the MMS framework. See section 10.
- MM presentation, which may be used when rendering an MM on an MMS Client. See section 11.
- Security services that may be available to the MMS application on a per-link or end-to-end basis. See section 12.
- Content adaptation services that an MMS system may be able to provide before delivering an MM. See section 13.

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6. MMS Client / MMS Proxy-Relay Interface

As shown in Figure 2, the MMS Client interacts with the MMS Proxy-Relay. This operation is consistent with the WAP model where the MMS Proxy-Relay operates as an Origin Server (Pull Operations) or as a Push Initiator (Push Operations).

The relationship between the MMS Client and MMS Proxy-Relay is shown in Figure 3 and Figure 4 below for two different configurations of the WAP architecture and protocol stacks. Figure 3 assumes use of the original WAP architecture; in this case the messages that transit between the two components are normally transferred using a wireless transport such as WSP between the MMS Client and the WAP Gateway, and then transit over HTTP from the WAP Gateway to the MMS Proxy-Relay.

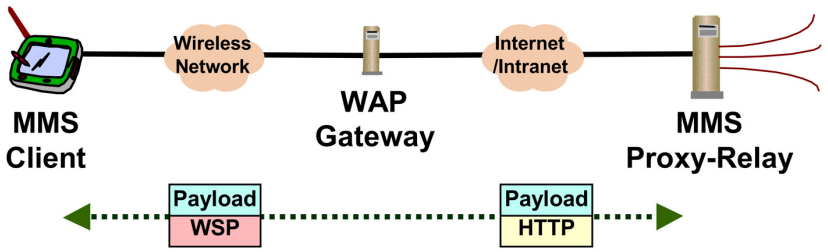

Figure 3 Implementation of MMS_M InterfaceUsing WAP 1.x Gateway

This link representation includes a few items that need to be described. The MMS Proxy-Relay is the network entity that interacts with the user mailbox and is responsible for initiating the notification process to the MMS Client. The WAP Gateway provides standard WAP services needed to implement MMS in the original WAP architecture, these include: WSP invocation of HTTP methods; WAP PUSH services; OTA security; and Capability Negotiations (UAProf).

The above figure also shows a payload that is carried by WSP and HTTP. This payload represents the MMS application layer PDUs, which are described in the MMS Message Encapsulation document [MMSENCAPS]. It is expected that this data will be transported in its entirety between the MMS Proxy-Relay and the User's Terminal.

In a different architectural configuration HTTP is used to carry MMS PDUs directly between the MMS Client and the MMS Proxy-Relay, and a gateway is only needed for push functionality. The following figure outlines such an implementation of MMS_M; note that the gateway needed for push services is omitted from the figure. Also note that a PEP may be included in the MMS_M link to provide performance enhancements, as described in [WAPARCH].

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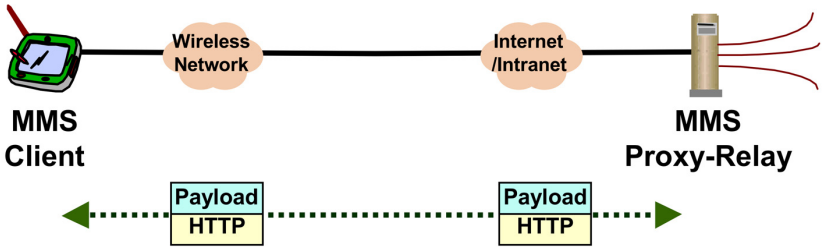

Figure 4 Implementation of MMS_M Interface Using HTTP Based Protocol Stack

The MMS application layer is the same in the different architectural configurations; the differences are contained in the two transport stacks, i.e., the WSP based protocol stack and the HTTP based protocol stack.

The MMS system is guided by activities between the MMS Client and MMS Proxy-Relay. These activities are described in the MMS Client Transaction document [MMSCTR] and the MMS Encapsulation document [MMSENCAPS].

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7. MMS Internet Email Interworking

One of the important links on the Network Diagram is the connection of the MMS Proxy-Relay to Email Servers connected via the Internet. This connectivity works in both directions.

7.1 Sending Messages To Internet Email Servers

For sent MMs, the MMS Proxy-Relay will submit the message to the addressed host using the SMTP protocol. The MM will be converted to standard Internet MIME format to permit the various media components to be carried consistently into the Internet environment. The MMS specific header fields will be converted into appropriate headers by prepending an 'X-Mms-' to the header name. This will permit MMS aware systems to understand the fields while not being problematic for non-MMS aware systems.

7.2 Receiving Messages Sent From Internet Email Systems

Received messages will be similarly converted. The MIME part of the message will be converted to the MMS format. Similarly, any headers found with a prefix of 'X-Mms-' can be converted back to the associated MMS header.

7.3 Retrieving Messages From Internet Email Servers

It will be important for MMS Clients to be able to retrieve messages that are stored on Internet Email servers. This is normally done through the use of the POP or IMAP protocols. Such retrievals are performed by the MMS Proxy-Relay (this is one of the proxy roles), which will then convert the data into an appropriate MMS format.

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8. MMS Proxy-Relay to Proxy-Relay Operation

MMS systems provide services and capabilities that are different than other messaging systems. When such systems communicate with each other, some of these services and capabilities are to be provided between them. Over time, it is expected that these specialised services and capabilities will be further enhanced. Therefore, it is important that these systems can inform and support the services between MMS systems.

If the MMS Proxy-Relay to Proxy-Relay operation is based on Internet email approaches, then SMTP/ESMTP may be used for the interconnect. Alternatively, the interconnect may employ some other suitable communication protocol.

8.1 Discovery of Peer MMS Proxy-Relay Elements

Before any efficient activities can be performed between cooperating MMS Proxy-Relays, an MMS Proxy-Relay will need to know that it is communicating with another MMS Proxy-Relay. Depending on the protocols used between these elements, different methods may be utilised. For example, when using normal SMTP email, the capability reporting schemes of the ESMTP [RFC1869]* and [RFC1870]* negotiation scheme would be the expected method.

* Note that ESMTP is specified across a large number of RFCs and those listed above, together with SMTP, simply define a framework that may be extended. Other specific aspects of ESTMP can be found by reading the relevant RFC related to the feature of interest.

With the awareness that an MMS Proxy-Relay is communicating with a peer component, they may be able to perform additional operations that could improve the efficiency or extend the communication capabilities between them. The effective or negotiated capabilities that could be supported between peer systems will be communicated as part of the discovery process.

8.2 Message Flows Between Cooperating MMS Proxy-Relays

The MMS Proxy-Relays will be responsible for extending the current data flows that have been documented for MMS Client to MMS Proxy-Relay (home system) to reach the MMS Proxy-Relay (target system) at another MMS system. These extended message flows could operate over SMTP or other communication protocol. The communication between these elements will utilise the MMS header fields available from the MMS Clients as well as new ones specifically for the peer MMS Proxy-Relay link.

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9. MMS Client-Side Structure

The general model of how the MMS user agent fits within the general WAP Client architecture is depicted in Figure 5.

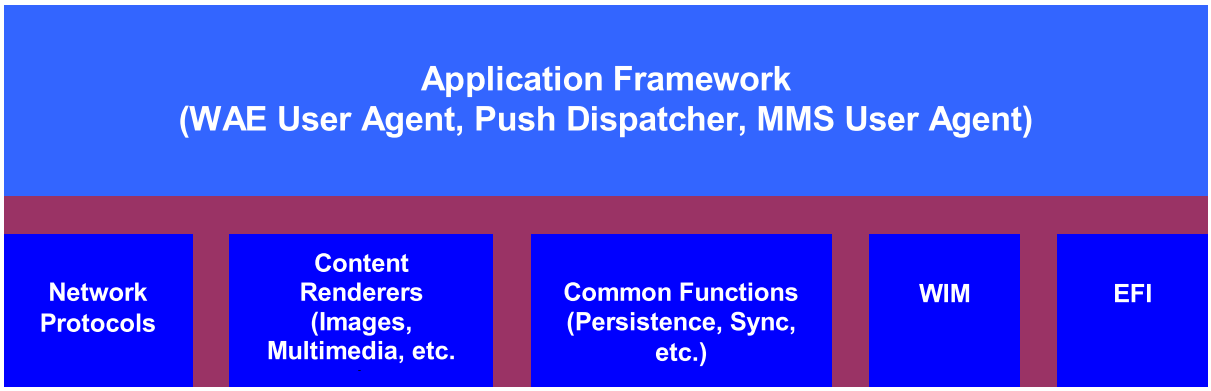

Figure 5 General WAP Client Architecture

The *MMS User Agent* is responsible for the composition and rendering of multimedia messages. MM rendering is performed by utilising the appropriate content rendering service. The MMS User Agent is also responsible for sending and receiving MMs by utilising the message transfer services of the appropriate network protocols.

The MMS User Agent, as described in the MMS specifications, is not dependent on, but may use, the services of the other components shown in Figure 5, i.e. the Common Functions, WIM and EFI.

Additional information about the general WAP Client architecture is available in the current [WAPWAE] document.

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10.MMS Addressing

An important aspect of messaging systems is the ability to address the users in a way that can be efficient for the system as well as meaningful for the senders of messages. This balance is difficult to achieve.

10.1 Internet Addressing

In the Internet world, where bandwidth is not a primary consideration, addresses are normally expressed in the email address paradigm. In this scheme, addresses look like *user@system* where the system specification may be a domain name or a fully qualified host address. In general, this scheme provides users the ability to have a complete and unique address in an unbounded text string. This scheme is very common and such addresses are routinely printed on business cards.

10.2 Wireless network addressing

In the wireless world, where bandwidth efficiency is critical, short address lengths and ease of user entry on limited keypads are the hallmarks of the various systems. For example, in GSM networks, a user's address is based upon the MSISDN number utilised by the device. Similarly, in many paging systems, users are assigned PINs that would permit a caller to deposit a message.

The MMS addressing model, as defined in [MMSENCAPS], makes such a more direct or efficient addressing scheme available to MMS subscribers and services. This is seen as particularly important for interoperability with legacy systems such as the above mentioned, and e.g. for mobile-to-mobile operation.

As message traffic has increased to wireless systems from the wireline world, most such systems have deployed servers that provide external entities the opportunity to address their email to the wireless subscribers directly. Many such systems utilise an *ID@carrier* approach to setting these addresses for access from email systems.

MMS employs an extensible addressing scheme that permits a variety of addressing paradigms to be supported. More specific details on addressing can be found in the MMS encapsulation specification [MMSENCAPS].

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11.MMS Presentation

11.1 Multimedia presentation concepts

The concept of MMS presentation means the ordering, layout, sequencing and timing of multimedia objects on the terminal screen and other devices such as a speaker. With MMS presentation, the sender of the multimedia message has the possibility to organise the multimedia content to a meaningful order and to instruct how the multimedia objects are rendered at the receiving terminal.

Today, terminals generally have small screens and limited audio capabilities. In the future, however, it can be expected that the capabilities of terminals will improve making full multimedia presentations possible. The use cases for MMS presentation include advertisements, news flashes etc. To allow content providers to create multimedia presentations compatible with as many terminals as possible, it is important that MMS presentations are handled consistently, and consideration is given to the current and future capabilities of terminals and their interoperability.

MM presentation is optional, as some terminals have very limited presentation capabilities. However, receiving terminals may still be able to render the received multimedia content as long as they support the media types in the message, even if the presentation instructions, such as sequencing, layout and timing information, are not supported.

11.2 Presentation examples

There are various alternatives for presentation language, most notably [WML] and Synchronised Multimedia Integration Language SMIL™ [SMIL].

11.2.1 WML

The WML presentation for multimedia messaging offers the same sequencing and layout capabilities as with browsing.

11.2.2 SMIL

The SMIL™ provides extended capabilities, such as timing of multimedia objects as well as animation.

The SMIL™ is a simple XML-based language that consists of a set of *modules* that define the semantics and syntax for certain areas of functionality. Examples of these modules are layout module, timing and synchronisation module and animation module. A SMIL™ *profile* is a collection of modules particular to an application domain. The SMIL™ basic profile is a lightweight profile providing limited number of modules and thus is particularly relevant to multimedia messaging.

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The MMS presentation language is transferred in the same message that the multimedia objects are transferred. Thus, a multimedia message is a compact package of multimedia objects and optional presentation information. The presentation language contains pointers (e.g., URLs) to the multimedia objects in the message.

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12.Security Considerations

The MMS service is primarily an application level service. As such, it is able to build upon various security services available to applications. For example, in the original WAP architecture which employs a WAP Gateway the communication between the MMS Client and a WAP Gateway may be encrypted by use of the services available from the WTLS service layer. Other security service may be accomplished by use of other defined security services that are available to the appropriate components.

Example security services include:

TLS The TLS [WP-TLS] transport layer security protocol provides for secure data transmission between the MMS Client and the MMS Proxy-Relay in architectural configurations that employ HTTP based protocol stacks for MMS_M implementation. TLS may also be used between the WAP Gateway and the MMS Proxy-Relay when MMS_M is implemented in the original WAP architecture.

WTLS The WAP WTLS [WTLS] transport layer security protocol provides for secure data transmission between the MMS Client and the WAP Gateway when MMS_M is implemented in the original WAP architecture.

WIM The WAP Identity Module [WIM] is used in performing WTLS and application level security functions, and especially, to store and process information needed for user identification and authentication.

PKI Public Key Infrastructure [PKI] refers to the infrastructure and procedures required to enable the trust relationships needed for the authentication of servers and clients.

S/MIME Secure MIME [RFC2633] provides a means of handling the encryption of MIME components. S/MIME provides a set of security services that includes authentication, message integrity, non-repudiation of origin (using digital signatures), privacy and data security (using encryption).

The MMS does not provide its own specific security support and while the usage of TLS and WTLS with MMS is defined by [MMSCTR], it does not mandate these or any other specific security solutions. Though it may be possible to encrypt the contents of a message, this raises the possibility that complete end-to-end security for MMS messages (i.e., between MMS Clients) as well as per-link security for control activities between MMS Client and MMS Proxy-Relay may be unattainable.

An aspect of the MMS user interface is that of conveying information related to the security and/or authentication of messages received or to be sent. As with some Internet browsers, iconic representations are available to provide basic information to users regarding the security of the viewed message. Additional details regarding the message can normally be viewed as well. Such schemes would be desirable for MMS Clients but are not being mandated at this time.

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13.Content Adaptation

One of the possible services that an MMS system may be able to provide is content adaptation. In effect, there may be the opportunity to convert, replace or delete certain data elements from a multimedia message before delivering it to the MMS Client.

13.1 Determining Need for Content Adaptation

Such service may be prompted for a variety of reasons:

- **Device Capability** – Devices may have limitations that may prevent them from being able to handle a particular type. These limitations may be based upon content type, characteristics or size (e.g. buffer space).
- **Bandwidth Considerations** – Certain data types may be inappropriate for a particular type of bearer (e.g. streaming over SMS). Such considerations may be based upon factors set by a user or a network operator.
- **Roaming Considerations** – There may be issues having various multimedia data conveyed over an alternate carrier's network. There may be service constraints or pricing considerations that may impact the delivery of message elements. Such filtering should occur at the 'home' system.

There are various services that may assist the MMS system to determine whether content adaptation is needed. In particular, the WAP UAProf [UAPROF] provides a mechanism to inform the MMS Proxy-Relay with information about the MMS Client. This information relates to characteristics of the device and serving network.

13.2 Content Adaptation Activities

Various forms of content adaptation may be performed. For example, graphic images may be removed, scaled or colour converted.

Specific content adaptation services are beyond the scope of the MMS specifications.

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14.Additional Service Descriptions

14.1 Charging and Billing in MMS

The charging criteria possible to use for WAP services and/or MMS are fundamentally different from those traditionally used in telecom, such as measuring of connection time or data volume. These can of course still be used to charge on the bearer level and thereby indirectly to charge end-users for MMS. However, it is predicted that a number of different charging methods and their combination will be used to fulfill each individual service provider's requirements.

Since MMS standards are technical specifications that define an interface protocol, the issue of charging and/or billing is outside the scope of the MMS specifications. [TS32200] and [TS32235] are good references that provide the overall architecture of a charging related system for MMS and CDR generation for MMS.

Instead of addressing a full charging/billing model, MMS can provide some hooks for charging, whereby a service provider may be able to implement a charging system based on for example [TS23140]. Reply-Charging is one example of such an enabler in MMS. Reply-Charging enables a user of the MMS to take over the charge for the sending of a reply-MM to their submitted MM from the recipient. The detailed service description of this feature can be found in [TS23140].

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15.OMA MMS Protocol Documents

- **MMS Architecture Overview**
  This document. This is to be a starting point for anybody wanting to know more about MMS.

- **MMS Client Transactions**
  The document [MMSCTR] describes the operation of the MMS messaging system as it operates between the MMS Client and the MMS Proxy-Relay when MMS protocol version 1.1 is used.

- **MMS Encapsulation Protocol**
  The document [MMSENCAPS] describes version 1.1 of the protocol operating between the MMS Client and the MMS Proxy-Relay.

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Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
WAP-205-MMSArchOverview-20010425-a	25 Apr 2001	
OMA-WAP-MMS-ARCH-V1_1	15 Jul 2004	Status changed to Approved by TP TP ref # OMA-TP-2004-0227-MMS-V1_1-for-final-approval

A.2 Draft/Candidate Version 1.1 History

Document Identifier	Date	Sections	Description
Candidate Version OMA-WAP-MMS-ARCH-V1_1	01 Nov 2002	n/a	The initial version of this document.

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