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Mail Markup Language - Version 1.1

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Abstract

Mail Markup Language (MML) is a simple tag based markup language used to describe and structure data in a document intended to represent communication across the medium of email. MML is written in W3C XML Schema language. All MML documents are XML documents that conform to the MML schema. This specification intends to replace RFC 5322.

IANA Considerations

This specification requests the registration of a namespace and two MIME types. The namespace name requested is MML. A static URI pointed to the location of the mail.xsd as hosted by a standards body is also requested for mapping to the requested namespace name. That URI would become the value of the MML:schemaLocation attribute. The MIME type application/mail+xml is also requested. The application/mail+xml MIME type will be used to identify a MML document for processing as mail over any standard mail protocol.

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1. Introduction

MML as a standard is both a language and a standard list of processing constraints upon that language.

1.1. Scope

This document seeks to fully describe the specification and syntax rules of the actual language, the constraints upon processing that language, and the inclusion of other standards or technologies.

1.2. Requirements

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [34].

If an implementation, feature, or constraint does not satisfy a requirement level of MUST, MUST NOT, or REQUIRED for its respective statement, clause, phrase, or section that implementation, feature, or constraint MUST be considered failed. Under such a circumstance, known as conditional compliance, a MML document MUST NOT be transmitted. The ideal MML document will satisfy conditional compliance, SHOULD and SHOULD NOT conditions, known as unconditional compliance.

1.3. Terminology

This document will use several terms to describe various features or components.

tag
: A tag is a code command enclosed in angle brackets such as, "". Every tag exists as pairs of an opening tag and a closing tag. All closing tags are identical to their opening counter-part except that are preceded by a forward slash character, such as "".

element
: The word "element" is synonymous and used interchangeably with the term "tag".

simple block
: A simple block is a tag that is capable of containing text and/or line-level tags, but is not capable of containing complex blocks.

complex block
: A complex block is a tag that is capable of containing simple blocks or complex blocks, but is not capable of containing text.

line-level tag
: Line-level tags are only capable of existing in simple blocks. Line-level tags cannot contain other tags.

processor
: The term processor is to refer to any application that processes, interprets, or seeks to process a MML document. The term processor MAY typically refer to email client applications, but is not limited to such. The term "MML processor" is directly synonymous to the term "mail client" used by other related specifications.

accessibility
Accessibility is the degree of ease from which any human is equally capable of receiving data intended for human consumption from the desired document or request. Accessibility MAY refer to persons with a sensory disability, a motor disability, or software impairment.

understandability
Understandability is the degree of ability by which a technology can be learned and used by a person who has never seen or used the technology previously. Understandability also refers to the lack of effort necessary for an experienced user to consume and process the technology.

semantics
Semantics refers to the degree of description provided by meta-data and syntax rules either statically or through nesting and hierarchal implementation thereof. The objective of semantics is to provide the most expansive description of data intended for human consumption without that description interfering with understandability during reading or writing.

structure
Structure refers to the effectual organization of data only as a result of well organized meta-data containers into a rigid hierarchy.

session
In the context of MML the term session only refers to an instance of communication, which is defined by the <session></session> tags.

URI
The abbreviation of URI is short for Uniform Resource Identifier. A URI is the address of a resource on a network or networks as defined by RFC 3986, addressed by RFC 3305, and supplemented by RFC 2368.

2. Philosophy of Design

The philosophy of design represents a shell container of decisions whose intent is certain beneficial objectives and to identify negative consequences. The design philosophies for MML creation are listed in order of most significant to less relevant.

2.1. Structure

Structure is the primary design consideration influencing MML. It is important that structure be the most important factor in the design of the language as all other design considerations are merely a result of the logic and conventions imposed by a well structured form.

The primary difference between MML and other markup languages is that proper structure is mandatorily imposed upon a document author. This rigid inflexibility produces several profoundly significant benefits that exist inherently, which would otherwise merely be referred as best use. The cost that comes from such rigidness is the inability to put content absolutely anywhere in a document to circumvent any potential processing flaws of a processing software.

2.2. Syntax Simplicity and Understandability

Syntax in MML MUST be well-formed XML that conforms to the MML schema. Every tag in MML MUST exist as a pair of opening and closing tags. Syntax in MML is simple and always uniform.

Tag names are English words and not abbreviations or shortcuts. This is critical to understandability. An abbreviation is a symbolic representation of its expanded value. Although it may be faster to write <p> instead of <paragraph> we are saving time and physical effort only at the expense of increase mental effort. If we know a <p> tag represents a paragraph then it becomes of a symbol of the word paragraph, which is a step of mental deduction.

As humans we are rather so consumed by symbolic use that it seems a trivial effort to back out a single step of symbolic deduction. The savings become significantly more noticeable given the quantity of which meta-data often occurs in large mark up documents. The end result is that it is lesser mentally exhausting to read a document with descriptive and simple meta-data using complete words.

2.3. Semantics

Semantics are necessary for binding data, which is useful only to humans, and processing syntax, which is only useful to language processors. The objectives of semantic processing is for semantic processors to parse human supplied data and make decisions upon data that result in output relative to human decisions.

MML was designed with consideration for applying semantics in the least specific manner. Tag names were created for understandability and not semantics. Any benefit received to semantics is purely consequential. There are two remedies to this intended lack of elaboration. Every tag in the <markup> section of MML is granted use of the role attribute. For the role attribute please see section 5.4.4. role Attribute. Hierarchal semantics are the primary unintended beneficiary of a rigid structure imposed upon the data. A combined use of the role attribute or the tag names and the hierarchal structure in which they exist is the second remedy for the lack of semantic elaboration.

Even though conventions in MML were not created to directly benefit semantics the conventions of semantic languages, such as Resource Document Framework, were the primary influencing factor in creating the concepts and rules for imposing structure and tag hierarchy.

2.4. Accessibility

It is an important factor that all persons are equally capable of accessing, using, and understanding documents defined as MML. Accessibility is a lesser important design factor as many concerns of accessibility are addressed by proper use of semantics, understandability, and usability. Usability is primarily a result of interaction of the data, which exceeds the scope of this document.

There are constraints upon processing specified by this document that may serve to benefit accessibility. See section 4.1. Processor Requirements and Constraints.

2.5. Presentation

Presentation is perhaps the least concern of all design factors influencing MML. All presentation will exist in either an external stylesheet(s) or the default presentational conventions supplied by the MML processor.

This version of MML only recognizes Cascading Style Sheets and Extensible Stylesheet Language as presentation languages. The degree of processing compliance afforded to those languages and which versions are process-able are processor specific concerns, which exceed the scope of this document. Please see section 3.4. Stylesheet Technologies for more information.

MML processors SHOULD make no assumption that there is an implied default presentation that any tag, element, or concept must adhere to. Please see section 4.2.1. Default Presentation.

2.6. Security

While security is always important it is of trivial concern to the describing of data, which is why security is a consideration for the design of MML, but is lowest priority. Much of the effort in assuring MML data remains confidential and maintains integrity rests on the processing of the MML processor, the security of the protocols used to transport the data, and the general security practices of document authors.

Nonrepudiation is the most important security consideration, except perhaps for encryption, concerning email. The job of nonrepudiation rests most prominently with proper storage practices of documents by users and time/date stamps imposed by email processors on the arrival of mail documents. MML does contribute to nonrepudiation by requiring a timestamp in a manner beyond user control. Please see section 4.1.4. Session Time-stamp and 5.2.2. <session> Tag.

MML does provide a method for specifying implementation of public key distribution to facilitate encryption. Please see section 3.6. Public Key Infrastructure.

MML also implements a description scheme for every attached asset using MIME to identify various types of media. Media can only be executed according to the specified MIME type value. The intent is that a file that looks like a graphic and has the file extension of a a graphic may actually be a malicious executable program, but if it has a specified MIME type of a graphic format it can only open as a graphic or it MUST NOT be processed. For more information please see section 3.8. Multipurpose Internet Mail Extensions and section 4.1.3. MIME Execution Restriction.

3. External Technologies

In order to advance the functionality of this technology it is necessary to incorporate use of prior existing standards.

3.1. Extensible Markup Language (XML) and W3C XML Schema

MML is written in W3C XML Schema, which is written XML. As a result MML code is case sensitive. This means all tag names MUST be lower case. XML also requires that all attribute values MUST be quoted, tags MUST be properly nested, and every opening tag MUST have a corresponding closing tag. Failure to adhere to these syntax rules will result in the document not validating, which will cause it to not send. Please see section 4.1.1. Validation for more information.

3.2. XForms 1.1

XForms is the only form method specified in MML. Where XForms usage is allowed by the MML schema it MUST be used in accordance with the XForms schema: http://www.w3.org/Markup/Forms/2002/XForms-Schema.xsd Processors MUST use XForms version 1.1 to be compliant with this version of MML.

3.3. Accessible Rich Internet Applications

The standards specification Accessible Rich Internet Applications, WAI-ARIA, is not included into this version of MML due to the specification not being formalized at the time of this writing. WAI-ARIA is intended to be implemented in future versions of MML. For more information please see: http://www.w3c.org/WAI/

3.4. Resource Document Framework

Resource Document Framework, RDF, is not an included technology of this specification, however RDF did significantly influence design patterns of MML. RDF implementation MAY occur as a server-side feature, an optional client specific feature, or a MML processor behavior feature. RDF implementation MUST NOT interfere with conventions, syntax, data, or meta-data supplied in the document directly. This is necessary so that a MML document maintains a

pre-RDF existence for distribution to other users that may not be capable of processing RDF. For more information please see: http://www.w3c.org/RDF/

3.5. Stylesheet Technologies

This version of MML recognizes only Cascading Style Sheets (CSS) and Extensible Stylesheets Language (XSL) as stylesheet languages. MML imposes no requirement to support stylesheets. If a MML processor does attempt to support a particular stylesheet it SHOULD state what version is supported and SHOULD fully support that version according to its specification. For more information on CSS please see http://www.w3.org/Style/CSS/ For more information on XSL please see http://www.w3.org/Style/XSL/

3.6. Behaviors and Scripting

MML does not support any scripting or behavior technologies. This version of MML does not provide a solution to likely cross-site scripting vulnerabilities, breaches of non-repudiation, or interference to the integrity of the data that may result from the execution of scripting at the user agent software. Standards and technologies that wish to dynamically alter or access a MML document SHOULD do so only using XPath or DOM expressions and MUST NOT violate the document segragation imposed by processing the <session> element.

3.7. Public Key Infrastructure

MML supports the transfer of public keys by directly embedding the hash value of the public key into the document. MML provides no support for specifications regarding encryption, data transport, or confidentiality. These are application specific and protocol features that exceed the scope of this document. Please see section 5.2.8. <public-key> tag for more information on MML implementation. For PKI specifications please see: http://www.rsa.com/rsalabs/pkcs/

3.8 Uniform Resource Identifier

Uniform Resource Identifier (URI) is a representation of an address to an external asset. MML requires the use of URIs to specify locations of any object or stylesheet. Aside from text the only data that MAY be included directly into the document are public key hashes. For additional information please refer to RFC 3305.

3.9. Multipurpose Internet Mail Extensions

Multipurpose Internet Mail Extensions (MIME) is specification designed to support an expanded character set beyond the basic 7-bit ASCII natively supported by SMTP. For more information on the MIME specification please refer to RFC 2045, RFC 2046, RFC 2047, RFC 4288, RFC 4289, and RFC 2077.

4. Processor Roles

The role of a processor of MML is to conform to the following specified requirements. Processors of MML are, however, allowed certain freedoms from presumption that are also specified.

MML processors are encouraged to test the limits of innovation. Diversity, usability, and customization are necessary results of competition. The intent of section 4.1. Processor Requirements and Constraints is to impose requirements upon MML processors to ensure the integrity of the language. The intent of section 4.2. Processor Allowances is to illustrate some areas where MML processor vendors are free to explore without fear of violating this specification.

4.1. Processor Requirements and Constraints

The intent of imposing requirements and constraints unto the processor is to provide a uniform existence for data, meta-data, and syntax rules contained in a MML document not at the burden of a document author.

4.1.1. Validation

It is absolutely essential that a MML document MUST validate against the MML schema prior to transmission. If a MML document does not validate it MUST NOT be transmitted as email across any email specific protocol or Hyper Text Transfer Protocol. A MML processor is not REQUIRED to process any malformed or invalid MML document.

It is not invalid, according to some schema validators, for a session author to include empty tags, also known as nil content, such as <style></style>. It is, however, invalid to include nil content elements, in accordance with the XML Schema standard, without explicitly stating the XSI:nil="true" attribute. Empty tags MUST be removed by the MML processor during validation. Every tag SHOULD contain text, other tags, or both if so allowed.

4.1.2. RFC 2822/5322 Conformance

A MML processor MUST create RFC 5322 conformant mail headers for backwards compatibility. MML aware clients/servers MUST remove this header data and instead rely only upon the header information specified within the MML code. This is necessary to ensure seamless transactions across the SMTP protocol to clients not prepared to receive MML. This header data MUST be created after document validation for transport and prior to the document being transported.

4.1.3. Session Separation and Presentation

MML processors MUST process each session of a MML document separately. This means a stylesheet specified in one particular session MUST NOT be processed in another session on the same document. For instance a background specified, via stylesheet, in one session cannot exist as a background in any other session unless so specified in each other session even if in the same document.

A MML processor SHOULD allow session authors to alter the presentation of all elements and content in a session even if those elements or content exist outside the message body. This is not a requirement because MML processors MAY choose to display the session header information only in their application shell opposed to text.

4.1.4. Session Preservation

All prior sessions received in a MML document MUST be preserved verbatim, including whitespace and presentation. Decisions upon prior sessions MUST NOT be allowed except whether external assets MAY be processed. A MML processor SHOULD take steps to prevent prior sessions from manual alteration by a session author.

4.1.5. Character Set

The character set for this version of MML MUST be UTF-16BE.

4.1.6. Session Time-stamp

The value of the time-stamp attribute MUST be written by the MML processor between the moment the session author submits the document for transmission and the validation by the MML processor. The MML processor MUST write over any value supplied by the author with the correct value. The value MUST be based upon the local system clock.

4.1.7. URI Resolution

MML processors MUST set a standard timeout for any URI that is referenced in a MML document. The length of that timeout MAY be determined by the MML processor. User adjustment to the timeout length setting of the MML processor is OPTIONAL. If a MML processor cannot resolve any resource at its specified URI timeout that resource MUST fail.

4.1.8. MIME Execution Restriction

Every object, stylesheet, or other external resource MUST be processed strictly according to its specified MIME type. If a resource does not match its associated MIME type it MUST NOT be executed. Processing of any external resource to a MML document by a MML processor is OPTIONAL.

4.1.9. Caching

External assets, such as stylesheets or objects, MUST be cacheable by the MML processor. Caching significantly improves performance by reducing the demand for bandwidth and allowing access to content even when offline. Options, configuration, and implementation MUST exist entirely at the discretion of the MML processor.

4.1.10. Local Processing

MML processors MUST locally contain all required code components necessary to process and validate a MML document according to the MML schema. These components can be obtained from the following list:

* http://mailmarkup.org/mail.xsd
* http://www.w3.org/MarkUp/Forms/2002/XForms-Schema.xsd
* http://www.w3.org/MarkUp/SCHEMA/xml-events-attribs-1.xsd
* http://www.w3.org/2001/XMLSchema.xsd
* http://www.w3.org/2001/03/xml.xsd

* http://www.w3.org/2001/XMLSchema.dtd
* http://www.w3.org/2001/datatypes.dtd
* http://mailmarkup.org/mime.xsd

MML processors MUST NOT require the use of a network or internet connection to process or validate a MML document.

4.1.11. MIME Catalogue

A MML processor's list of acceptable MIME types MUST exist as a local schema file. This file MUST be available for editing by either an administrator or common user. Adding new MIME types to the list will likely result in a failure to process outside an internal network. Removing MIME types from the list MUST result in a failure to process media of those types. By default the values in the MIME catalogue file will be every IANA registered type.

4.1.12. From and Reply-to Tags

The <from> and <reply-to> tags are REQUIRED tags, so the tags will exist even if their content is null. If their content is null the MML processor MUST supply default values of the session author's email address. This MML processor supplied default content MUST be supplied by the MML processor between the moment the session author submits the document for transmission and the REQUIRED validation by the MML processor. The default value for the <from> tag MUST be the address represented by the author. The default value for the <reply-to> tag MUST match the default value of the <from> tag.

Session authors are allowed to specify content for these elements to hide their email address. The benefit is to customize how other session authors can control direct traffic, such as reply and forward traffic, back to their email address. It is important to understand the actual traffic benefit of these fields as they offer absolutely no security advantage. MML processors MUST NOT use, process, or regulate the <from> or <reply-to> tags for any intent related to security. Email transmission protocols operate in unencrypted plain-text by default, which is where any user can easily find any address or identity information.

Please see section 5.2.4. <to>, <copy>, blind-Copy>, and <from> Tags and section 5.2.9. <reply-to>.

4.1.13. Attachments

Attachments to the current session MUST be sent with the actual MML document. Attachment persistence is OPTIONAL to the MML processor vendor. Attachment persistence refers to whether or not attachments will continue to be sent with the MML document after the document session arrives at its originally intended destination(s). A MML processor SHOULD allow users to choose to allow persistence.

Attachments MUST be processed only according to their specified type. Processing of attachments by the MML processor is OPTIONAL. The type

specified for <collection-type> MUST represent every file in that respective <collection>. If the <collection-type> tag is not present the files located in the collection MUST NOT be executable from the MML processor, MML document, or any other mail service software.

4.1.14. Processing of <plain-text>

Content provided in <plain-text> MUST be processed as plain text characters and/or whitespace only. Code MUST NOT be processed, rendered, or transformed in this tag. XML reserved syntax characters MUST be properly escaped automatically by the MML processor or validation SHOULD expect to fail.

4.1.15. Processing of style Attribute

The value supplied by the style attribute is defined in the MML schema as lowercase alpha characters, uppercase alpha characters, and/or numbers plus a colon character (:) plus lowercase alpha characters, uppercase alpha characters, and/or numbers. The characters supplied prior to the colon MUST represent the value supplied in a <stylesheet-namespace> element of the same session. The value supplied after the colon SHOULD represent a reusable processing declaration defined inside the stylesheet, such as a CSS class. An example of a supplied value: "namespaceName:CSSclass09".

Stylesheet processing is OPTIONAL. If the noted stylesheet cannot be resolved or if the value supplied by the style attribute is either malformed or fails to match a stylesheet of the same session this attribute MUST NOT be processed.

4.1.16. Internationalization Attribute Processing

Text MUST be processed in accordance with the defined values for the four internationalization attributes. For processing descriptions please refer to these sections:

* section 5.4.6. direction Attribute
* section 5.4.7. orientation Attribute
* section 5.4.8. wrap Attribute
* section 5.4.9. section-language Attribute

Failure to process internationalization attributes according to their definition MUST result in conditional compliance failure.

4.1.17. xmlns Attribute

The xmlns attribute is not defined in this specification. It is defined in the specification for Namespaces in XML 1.0. It is considered an included technology by virtue of the xml.xsd schema that is imported into the XMLSchema.xsd schema that is imported into the mail.xsd that defines MML. Use of the xmlns attribute MUST be allowed on the <session> element and any element contained by the <session> element in accordance with XML processing guidance defined by XML and Namespace standards.

4.1.18. refer Attribute Processing

The refer attribute MUST NOT be allowed to reference id values outside the specific <markup> element containing the refer attribute. For more information see 5.4.12 refer Attribute.

4.2. Processor Allowances

This document does not exist to define the role of MML processors for features that exceed the scope of this document. This section only serves to dispel assumptions and specify certain freedoms allowed to MML processors, which are not be allowed to processors of other markup languages.

4.2.1. Default Presentation

This specification does not make any statements regarding presentation of the language. This means a MML processor is free to determine the default presentation for tags and objects. This default presentation MAY apply to any or all parts of a MML document. This means that presentation provided from a MML processor fits a wider scope than presentation specified by a MML author since any MML author can only specify presentation by use of an external stylesheet and stylesheet processing is limited to its session of the document.

MML processor default presentation MUST be lower priority than presentation defined in a stylesheet. If a conflict in presentation arises between the default and a stylesheet the presentation specified by the stylesheet MUST dominate even in regards to cascading. This means a MML processor determines font size, color, font, and so on until so specified by a stylesheet. A MML processor determines, by default, whether complex and simple blocks impose a line break, wrap, float, or so on.

A MML processor SHOULD allow a user to customize or alter its default presentation. This specification will not mandate customization, however, accessibility concerns SHOULD be considered for changing text size, turning off stylesheets, and replacing objects with their respective text content.

4.2.2. Default Behaviors

This specification states no directive for behaviors or controls upon the data or the usability thereof. There is no convention for allowing client-side scripting in MML and any scripting that does exist MUST be processed as plain text content. MML processors SHOULD allow behaviors that increase accessibility more importantly than usability.

Section 3.3. Resource Document Framework states that RDF is not an included technology in this specification and MUST NOT interfere with conventions, syntax, data, or meta-data supplied in the document

directly. What it does not say is that semantic technologies MAY be used to auto-fill many areas of MML based upon a user's data habits. Semantic technologies MAY also be used for searching, data sorting, or other processing features to the data defined by the MML document. Those semantic technologies MUST NOT, however, alter the contents of the MML document.

4.2.3. Processing Elaborations Over Native MML Definitions

MML processors MUST be capable of processing the full MML specification. MML processors MAY allow processing of or definition of elements or conventions not defined by this MML specification. Such elaborations MUST NOT interfere, limit, constrain, remove, or disable any aspect of the MML specification. Any elaboration, element, or convention not defined by this MML specification is OPTIONAL of MML processors.

5. MML Schema Documentation

This section is intended to provide a description of the language along with justifications for certain conventions used. This section is informational only. All processing declarations are stated in section 4. Processor Roles and section 5. MML Schema.

If an element is followed by "0" it MAY occur 0 or 1 time. If an element is followed by "+" it MUST occur once, but it MAY occur more than once. If an item is followed by "0+" it MAY occur 0 or more times. If an element does not have these descriptors it MUST occur once and only once. Attributes MAY be followed by "0", which indicates the attribute in concern is optional. Attributes MUST NOT occur more than once in any element.

Those elements noted as (XForms) are defined by the XForms specification and not this document. For more information see section 3.2. XForms and 4.1.8. Local Processing. These elements MUST be processed in strict accordance with the XForms schema.

5.1. MIME Type Usage and mime.xsd

MIME types MUST be stored in the mime.xsd document, which is merely a catalogue of all IANA registered MIME types at the time of this writing. The information stored in mime.xsd is used in the MML schema through the use of the "mime-type" schema complex type.

Elements based upon the "mime-type" element type are allowed only one of nine possible child elements. These child elements each represent a IANA registered content type. The values for those child elements MUST be a MIME sub-type that exists in the local mime.xsd file. The child elements are:

* <application> or <audio> or <example> or <image> or <message> or <model> or <multipart> or <text> or <video>

5.2. MML Header Documentation

The code described in this section exists in MML documents without regard to how the message is formatted. For more information about the message body see section 5.2.2. <session> Tag and section 5.3. <markup> Element Documentation.

5.2.1. Root Element

The root element of MML is the tag <mail>. The root tag is only capable of containing <session> elements. This tag MUST contain the following attributes:

* mail-type="application/mail+xml"
* version="1.0"
* xmlns:xfm="http://www.w3.org/2002/xforms"
* xmlns:xs="http://www.w3.org/2001/XMLSchema"

5.2.2. <session> Tag

The session tag contains all information to represent an instance of communication including markup and header information. A session tag's child tags are as follows:

* <xsd:import> 0+
* <xsd:include> 0+
* <address>
* <attachments> 0
* <subject>
* <presentation> 0
* <source> or <markup> or <plain-text>

The <session> tag's attributes:

* time-stamp
* language (optional)

The session tag allows three methods of communicating the message body. The source method allows a session author to send an external resource as the message body. Please see section 5.2.26 <source> Tag. The plain-text method allows a session author to communicate using only text characters and whitespace. Please see section 5.2.29. <plain-text> Tag. The markup method allows a section author to use MML markup to describe the data. Please see section 5.2.30. <markup> Tag and section 5.3. <markup> Organization of Types and Groups and 5.4. <markup> Attributes and 5.5. <markup> Elements.

The time-stamp attribute is described in section 4.1.6. Session Time-stamp. The optional language attribute allows a session author to describe the majority language of the session using values appropriate to the XML Schema language data type. The default value is "en" if none is specified. Mail client software SHOULD allow a user to specify a default value for the language attribute.

5.2.3. <address> Tag

The address tag is a high level tag designed to store child tags containing email address information. The child tags are:

* <to> +
* <copy> 0+
* <blind-copy> 0+
* <reply-to>
* <from>

5.2.4. <to>, <copy>, <blind-Copy>, and <from> Tags

These tags are identical in their syntax. They store only the value of a properly formed email address. They may contain the optional attributes of alias and public-key. The alias is intended to contain a value more human readable representation of an email address, such as a person's name. The public-key attribute is intended to store text characters that represent a hash function name and a hashed public-key for asymmetric encryption. These two values MUST be separated by a colon only with the hashed key value after the colon. The hash function name MUST be uppercase alpha or numbers only.

The <to>, <copy>, <blind-Copy>, and <from> tag's attributes:

* alias (optional)
* public-key (optional)

5.2.5. <reply-to> Tag

The <reply-to> tag is identical to the <from> tag except that it may contain either a valid email address or a value of no-reply. This tag is used to set an address for deflecting email replys from the address used to send the email or to establish an alternate destination for receiving replies.

5.2.6. <attachments> Tag

The <attachments> tag is a high level tag for specifying file(s) for transfer with the document. Attached files are not intended for processing in the message body. This tag has two children which may occur as many times as needed. At a minimum only one of these child elements MUST occur:

* <collection> + and/or <file> +

5.2.7 <collection> Tag

The <collection> tag is intended to serve as a collection of multiple files of the same specified type. This tag has four child tags:

* <collection-name>
* <collection-file> +
* <collection-type> 0
* <collection-description>

5.2.8. <collection-name> Tag

<collection-name> tag is a REQUIRED child of <collection>. This may be any string value on a single line. The intent of this tag is to provide a simple name or label for the attached collection.

5.2.9. <collection-file> Tag

<collection-file> tag stores the file name of a particular file in a collection. This tag MUST exist for each file that is to exist in the collection.

5.2.10. <collection-type> Tag

The <collection-type> tag is a "mime-type" complex-type tag as specified in mime.xsd. The value provided for this tag MUST represent every file in the collection. This tag is OPTIONAL. If this tag is not present the files present in the collection MUST NOT be processed by the MML processor. See section 4.1.11. Attachments for information on processing requirements. Please see section 5.1. MIME Type Usage and mime.xsd for information about the specified type "mime-type". MML processors are not REQUIRED to process attached collections.

5.2.11. <collection-description> Tag

This tag exists to specify a text description of the collection. The content for this tag MAY represent examples of intended use, explanations, file ownership, origin information, and so forth.

5.2.12. <file> Tag

The <file> tag is intended to serve as a single attached file. This tag has three child tags:

* <file-name>
* <file-type>
* <file-description>

5.2.13. <file-name> Tag

<file-name> tag is a REQUIRED child of <file>. The value for this tag MUST be a non-colonized name. This tag represents the name of the file being attached.

5.2.14. <file-type> Tag

This tag is of type "mime-type". The attached file MUST be processed according to the value supplied in this tag, or it MUST NOT be processed by a MML processor. Processing of attached files by MML processors is OPTIONAL.

5.2.15. <file-description> Tag

This tag allows a session author to enter any normalized string value that describes the attached file. This tag is REQUIRED.

5.2.16. <subject> Tag

The <subject> tag value id a normalized string. This REQUIRED tag sets the subject of the document session. This tag is equivalent to the subject of traditional email.

5.2.17. <presentation> Tag

All presentation, aside from MML default presentation, is set for a session in this high level tag. This tag is nothing more than a container for its one child element that may occur more than once.

* <stylesheet> +

5.2.18. <stylesheet> Tag

Each <stylesheet> tag represents a single stylesheet reference. This tag MUST have a URI of valid syntax as its value. The optional media attribute identifies the output media the stylesheet is attempting to supply presentation for, which defaults to a value of "screen". Required attribute style-namespace is a unique value that will serve as named prefix for stylesheet declarations from this stylesheet. The value for style-namespace MUST follow the same syntax and processing requirements as the attribute id. This attribute value MUST be unique within the scope of the <session> and SHALL NOT be unique in the entirety of a MML document. The prefix is REQUIRED for stylesheet references using the "style" attribute that is available to elements in the <markup> section of the session. See section 5.4.3. style Attribute for more information. The REQUIRED attribute, "style-type", accepts only one of three values:

* application/xslt+xml
* text/css

5.2.19. <source> Tag

The <source> tag is one of three methods of creating the message body. The intent of this tag is to allow an external resource to act as the message body. There is no requirement for a MML processor to process any external resource, so the content established by the <source> tag SHALL NOT always be communicated. This tag has two REQUIRED children:

* <source-uri>
* <source-type>

5.2.20. <source-uri> Tag

This tag MUST only contain a URI of the requested resource that is to act as the body of the session.

5.2.21. <source-type> Tag

This tag is of element type "mime-type". The type determines how or if the external resource described in <source-uri> MUST be processed by the document's destination.

5.2.22. <plain-text> Tag

This tag is the second of the three methods for communicating the body of the session. This tag MUST contain only plain text. Code MUST NOT be processed in this tag. The intent of this tag is to allow session authors to communicate using text without interference to the processing of that content. Presentation MAY be applied to <plain-text> content if the MML processor so allows and a stylesheet is provided.

5.2.23. <markup> Tag

This tag allows the use of MML to describe and organize content. This is the advised method of communicating content in MML. See section 5.3. <markup> Element Documentation for more information.

5.3. <markup> Organization of Types and Groups

This section is intended to providing descriptive documentation for the part of the language dedicated to describing information that is intended to be read by an email recipient as a message body.

5.3.1. <markup> Element Organization

The elements in this section of MML are arranged in three groups: complex-blocks, simple-blocks, and inline elements.

A complex-block is a tag that is capable of containing of either simple-blocks or simple-blocks plus other complex-blocks. Complex-blocks are not capable of containing text content or inline elements. These following tags are the high level complex-blocks:

* <define-list>
* <navigation-list>
* <order-list>
* <unorder-list>
* <table>
* <section>
* <form>

A simple-block is a tag that is capable of containing text and inline elements, but is not capable of containing other simple-blocks or complex-blocks.

* <block-code>
* <block-quote>
* <citation>
* <heading>
* <object>
* <paragraph>
* <separator>

Inline elements are not structural elements. These elements MUST exist in a simple-block container. Inline elements are intended to describe text content, supply additional meta-data, or apply more specific presentation.

* form controls (XForms)
* <short>
* <button>
* <cite>
* <emphasis>
* <identifier>
* <quote>
* <format>
*
* <title>

5.3.2. <markup> Attribute Organization

The attributes in the <markup> section of MML are arranged in the following attribute groups: "core attributes", "core attributes plus uri", "internationalization attributes", and "cell attributes". The "core attributes" are applied to nearly every element in the markup section. This attribute group is always optional. The group contains the following attributes:

* id
* title
* style
* role

The "core attributes plus uri" group is literally the "core attributes" group with the added uri attribute. It was necessary to specify these two groups separately because many elements require a URI and many MUST NOT receive a URI. These attributes are in the "core attributes plus uri" group:

* id
* title
* style
* role
* uri

The "internationalization attributes" exist only to alter the order in which text is rendered. This is not a presentation issue of altering how text appears, but how it functionally contributes to processing dependencies to the computer for the benefit of assistive technologies. MML processors SHOULD allow users to determine the default rendering methods of text.

* direction
* orientation
* wrap
* section-language

The "cell attributes" group is a set of attributes specific to table cell elements. These attributes include the following:

* span-column
* span-row

5.4. <markup> Attributes

This section is a per attribute list of attributes used by variou tags in the <markup> section of a MML document.

5.4.1. id Attribute

This attribute exists to assign a unique identification to an element. The value for this attribute MUST NOT contain punctuation, white space, or XML syntax characters. The value MUST allow Unicode word characters in accordance with the XML regular expression definition for a word character. This attribute is intended to create a unique hook to a particular element for MML processor specific behavior or presentation. There are some elements that

exist as a pair set and require the id attribute to refer to each other. The id attribute MUST be unique per <session> section and SHALL NOT be unique per a MML document of multiple sessions.

5.4.2. title Attribute

The title attribute is intended to supply additional content to an element beyond its contained text. The value for this attribute MUST be whitespace normalized text. This attribute is supplied for the semantic and accessibility benefits of expanded meta-data for human consumption.

5.4.3. style Attribute

This attribute exists to reference a reusable stylesheet property. The value for this attribute MUST be a set of Unicode word characters in accordance with the XML regular expression definition of a word character plus a colon followed by a series of Unicode word characters. The value before the colon MUST represent the value of any supplied stylesheet-namespace attribute. This tells the MML processor which stylesheet the style reference is referring to. The value after the colon MUST represent some designation defined in the stylesheet, such as a CSS class name. An example is: "namespace:CSSclass09".

5.4.4. role Attribute

This attribute is intended to allow for specific semantic redefinition of any element where its use is allowed. If a session author had the ability to rename a tag to something more semantically specific that new name is the value that SHOULD fill the role attribute. The value of the role attribute SHOULD NOT challenge or contradict the intent of the named element it is used with.

This attribute is expected to offer significantly expanded utility in future versions of MML. The WAI-ARIA technology and RDF derived technologies are expected to benefit from use of the role attribute.

5.4.5. uri Attribute

This attribute MUST contain only a URI value as defined by RFC 3986 or RFC 2368 for email addresses specifically. Use of this attribute is equivalent to imposing a webpage hyperlink. A same-document referrence, referred to as a URI fragment, MUST refer only to the value of a specified id attribute value within the same session.

5.4.6. direction Attribute

The direction Attribute determines which direction the text is to flow as it is typed. The default value is left to right if orientation has a value of horizontal or top to bottom if orientation has a value of vertical. The acceptable values are "tl", which indicates starting from the top or left, or "br", which indicates starting from the bottom or right.

5.4.7. orientation Attribute

This attribute determines whether text characters render in a vertical or horizontal manner. The acceptable values are "horizontal" or "vertical". Horizontal is the default value.

5.4.8. wrap Attribute

This attribute determines how lines of text are rendered to the page. The acceptable values for this attribute are "standard", "reverse", or "none". A value of "standard" does nothing different and is the default value. The value "reverse" MUST force text render opposite of its standard behavior.

Assuming direction and orientation are at default standard behavior is to wrap a line of text below the prior existing text. Under those conditions a value of "reverse" MUST force the line of text to wrap above the prior existing line of text.

A value of "none" forces the text to not wrap. Under the condition that non-wrapping text is wider or taller than its container the container MUST stretch and the page MUST scroll to keep the text visibly legible so long as there are not presentation specifications to the contrary.

5.4.9. section-language Attribute

The attribute section-language specifies the language of a particular section, container, or element in the <markup> section. This is absolutely necessary to alert readers and semantic devices that the natural language has changed from the default specified language. The values for this attribute MUST be ISO 639 language codes.

5.4.10. span-column Attribute

This attribute allows a <table-cell> or <head-cell> to occupy more than one column in a table. The values for this attribute MUST be a positive integer. The default value is "1".

5.4.11. span-row Attribute

The attribute span-row allows a <table-cell> or <head-cell> to occupy more than one row in a table. The values for this attribute MUST be a positive integer. The default value is "1".

5.4.12. refer Attribute

This attribute is a reference to the value of an id attribute supplied on another element of the same <markup> section. If the value of this attribute does not match an existent id attribute value of only the same session the document MUST NOT validate.

5.4.13. scope Attribute

This attribute is used in table header cells to determine which table cells the header is providing a heading for. The values for this attribute MUST be: column, row, group-column, or group-row.

The value "column" dictates that a header cell is providing a heading for only the first column of cells the header cell occupies. The value "row" dictates that a header cell is providing a heading for only the first row of cells the header cell occupies. A value of "group-column" dictates that a header cell provides a heading for all cells in all columns that it occupies. The value "group-row" dictates the header cell is providing a heading for all cells in all rows it occupies.

The word first, as used in defining column and row as values to the scope attribute, MUST refer to the first group of elements as dictated by the rendering direction of text set using internationalization attributes.

5.4.14. long-form Attribute

This attribute MUST serve to represent the expanded text that is described by the <short> element. An example is: <short long-form="Mail Markup Language">MML</short>.

5.5. <markup> Elements

This section is a per element list of all elements that MAY exist in the <markup> section of a MML document.

5.5.1. <define-list> Tag

This element is intended to establish a list of definitions by matching any number of defining terms to any number of definitions. This element contains only one child element, but that element may be used more than once.

Child:

* <define-item> +

Attributes:

* core attributes 0

5.5.2. <define-item> Tag

The <define-item> tag represents a single defining instance. The associations drawn by the child tags are as follows: multiple defining terms mapped to a single definition, a single term mapped against multiple definitions, or multiple terms that commonly share multiple definitions. As a result of these three possible associations at least one of each child element MUST occur.

Children:

* <define-term> +
* <definition> +

Attributes:

* core attributes 0

5.5.3. <define-term> Tag

This tag is intended to contain a single term, phrase, or clause to be defined. The value for this tag MUST be whitespace normalized text.

Attributes:

* core attributes plus uri 0
* internationalization attributes 0

5.5.4. <definition> Tag

This tag is intended to contain the definition text that defines the associated terms. The value for this tag can be text and inline elements.

Children:

* inline elements 0+

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.5. <navigation-list> Tag

The <navigation-list> tag establishes a list of items that exist to either direct traffic or create a menu of URIs. This tag allows for either a heading or a set of descriptive text and at least one navigation item.

Children:

* <heading> 0 or <identifier> 0
* <navigation-item> +

Attributes:

* core attributes 0

5.5.6. <navigation-item> Tag

This element is a single instance of navigation in a list of navigation choices. This element may contain either an object for navigation or text for navigation as determined by its child tags. A uri attribute is REQUIRED on this element.

Children:

* <navigation-object> or <navigation-text>

Attributes:

* core attributes 0
* uri

5.5.7. <navigation-object> Tag

The <navigation-object> is a standard <object> that is modified to not allow use of the uri attribute. This tag SHOULD only be used if the focus of navigation for the <navigation-item> of concern is an external resource expected to be processed into the content of the

message body. Three children elements are REQUIRED. For information on the child elements see sections 5.5.25. <object-text> Tag, 5.5.26. <object-uri> Tag, and 5.5.27. <object-type> Tag.

It is important that an object contain text content that describes its resource. There is no requirement for MML processors to process any external resource. If the resource does fail to process the text contained by the object MUST display.

Children:

* <object-text>
* <object-uri>
* <object-type>

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.8. <navigation-text> Tag

This element contains text and whitespace that is the focus of a navigation item. This tag has no child elements.

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.9. <order-list> Tag

An ordered list is a list where each item in that list is enumerated in the meta-data so that the position of elements in the list relative to other list items is valid data. Whether or not this enumeration appears is to a human reader is strictly a presentation concern. This element is allowed descriptive text in the form of a <heading> or <identifier> child. Each item in the list MUST exist in the <list-item> child. An example of a list that must be ordered is step-by-step directions, such as a recipie.

Children:

* <heading> 0 or <identifier> 0
* <list-item> +

Attributes:

* core attributes 0

5.5.10. <unorder-list> Tag

An unordered list is nearly identical to an ordered list except that list items are not enumerated. This means position of items in the list is irrelevant.

Children:

* <heading> 0 or <identifier> 0
* <list-item> +

Attributes:

* core attributes 0

5.5.11. <list-item> Tag

This element represents a single listed instantiation in a either an ordered or unordered list. This element may contain a single simple block element or text plus 0 or more inline elements.

Children:

* simple block element or text plus inline elements 0+

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.12. <form> Tag

The <form> tag is the high level parent container of a form. A form allows organized controls upon input and submission of information in various methods allowed by the XForms standard.

Children:

* <model> (XForms)
* <form-body>

5.5.13. <form-body>

The <form-body> element is intended to contain all the form controls that a user could interact with plus other MML elements.

Children:

* <define-list> 0+
* <navigation-list> 0+
* <order-list> 0+
* <unorder-list> 0+
* <table> 0+
* simple blocks 0+
* form controls 0+ (XForms)

5.5.14. <table> Tag

The <table> element allows authors to store and organize data in a grid or chart fashion.

Children:

* <head-row> 0
* <table-row> +

Attributes:

* core attributes 0

5.5.15. <head-row> Tag

The header row is a container of header cells to provide meta-data for tables.

Child:

* <head-cell> +

Attributes:

* core attributes 0

5.5.16. <table-row> Tag

A <table-row> MAY carry header cells or standard table cells. A row is the standard unit of organization in a MML table.

Children:

* <head-cell> + or <table-cell> +

Attributes:

* core attributes 0

5.5.17. <head-cell> Tag

A header cell provides meta-data that either labels or describes the data contained within its scope. The scope of the header cell is determined by use of the scope attribute. See section 5.4.13. scope Attribute for more information. A header cell MUST contain either a single simple block or text plus any number of inline elements.

Children:

* simple blocks 0 or text plus inline elements 0+

Attributes:

* cell attributes 0
* core attributes 0
* internationalization attributes 0
* scope 0

5.5.18. <table-cell> Tag

The table cell is the standard unit of data in a table. A table cell is not intended to provide any meta-data about the table or the structure of the table. A table cell is intended to provide data directly to the user. A table cell MUST contain either a single complex block or text plus any number of inline elements.

Children:

* simple blocks 0 or text plus inline elements 0+

Attributes:

* cell attributes 0
* core attributes 0
* internationalization attributes 0

5.5.19. <section> Tag

A section is a high level structural organization block. This is the only complex block capable of containing itself, such as nesting. The intent of the <section> tag is to subdivide the markup into various smaller areas for content organization, separation, and semantics.

Children:

* complex blocks 0+ and/or simple blocks 0+

Attributes:

* core attributes 0

5.5.20. <block-code> Tag

The block code simple block is intended to convey and describe code. The contents of this container MUST NOT directly contain XML reserved characters. An XML processor cannot be told to not process characters that construct its syntax. These reserved characters can be used if they are escaped with a character entity reference. Unlike the <plain-text> tag it is the author's responsibility to ensure the contents of this element are properly encoded. Improperly encoded reserved characters SHOULD expect a result of failure at validation. The reserved characters and their corresponding character entity references are:

Character	Hex	Name
<	<	<
>	>	>
&	&	&
"	"	"
'	'	'

Children:

* text and inline elements 0+

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.21. <block-quote> Tag

A block quote is a large quotation that MAY span several statements. This element can contain text and any number of inline elements.

Children:

* text and inline elements 0+

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.22. <citation> Tag

A citation is a descriptive reference to a piece of information used in content by a session author. The information referenced by the <citation> tag automatically points to the content that requires it by use of a REQUIRED id attribute, which is referred to by the inline tag <cite>. See section 5.5.29 <cite> Tag. This element contains text and any number of inline elements.

Children:

*text and inline elements 0+

Attributes:

* id
* title 0
* style 0
* role 0
* internationalization attributes 0

5.5.23. <heading> Tag

A heading is a short block of text that describes the content that is to follow. The <heading> tag MUST contain text and MAY contain 0 or more inline elements.

Children:

* text and inline elements 0+

Attributes:

* core attributes 0
* internationalization attributes 0

5.5.24. <object> Tag

An object is any external resource that is intended to be processed among the content of the message body, such as an image or video. Objects have three REQUIRED child tags.

It is important that an object contain text content that describes its resource. It is OPTIONAL for MML processors to process any external resource. If the resource fails to process according to the value of <object-type> the text contained by the object MUST display.

Children:

* <object-text>
* <object-uri>
* <object-type>
* inline elements 0+

Attributes:

* core attributes
* internationalization attributes

5.5.25. <object-text> Tag

Object text is the alternative text content that is to be rendered as content if the object cannot be resolved or processed.

5.5.26. <object-uri> Tag

This element MUST only contain a URI value and that URI MUST point to the location of a resource to appear in the message body. This element allows no child elements or attributes.

5.5.27. <object-type> Tag

This element is of type "mime-type". The object pointed to by the sibling <object-uri> tag MUST be processed only according to the type specified by this tag.

5.5.28. <paragraph> Tag

This element is the standard generic container of text and inline elements in a MML document. This element represents a paragraph and text is most typically grouped in paragraphs.

Children:

* text and inline elements 0+

Attributes:
* core attributes 0
* internationalization attributes 0

5.5.29. <separator> Tag

This element is intended for semantic and structural purposes only. Use of this element indicates a structural obstruction in the flow or organization of content within a single section. This element MAY contain text, which would indicate or explain the nature or reasoning of separation mandated by use of this element.

Children:
* text and inline elements 0+

Attributes:
* core attributes 0
* internationalization attributes 0

5.5.30. <short> Tag

This inline element describes text that is a short-hand value, such as an abbreviation or acronym.

Attributes:
* long-form
* core attributes plus uri 0

5.5.31. <button> Tag

This element exists to encourage interaction from a user outside of a form. This version of MML does not allow for client-side scripting, limiting the potential of a button, although a button MAY be able to interact with media that performs its own internal scripting, such as Flash media.

Attributes:
* refer 0
* core attributes plus uri 0

5.5.32. <cite> Tag

The <cite> tag is intended to contain text begging a citation. The refer attribute is REQUIRED as it MUST point to the id attribute of a <citation> in the same <markup> section of the document. The refer attribute on this element MAY act as a fragment URI to send users to the location of the targeted <citation> element in the session.

Attributes:
* refer
* core attributes 0

5.5.33. <emphasis> Tag

This tag indicates the text it contains is more important than other text of the same context.

Attributes:
* core attributes plus uri 0

5.5.34. <identifier> Tag

This element is intended to provide a text label that describes some other element. This element has a REQUIRED attribute of refer so that it may refer to the id of the element it is attempting to describe.

Attributes:

* refer
* core attributes plus uri 0

5.5.35. <quote> Tag

This element indicates the content it contains is a quotation.

Attributes:

* core attributes plus uri 0

5.5.36. <format> Tag

The format tag is a special tag. This is the only tag in the entire MML tag set that is deliberately intended to provide no semantic data. This tag is available to provide access to the core attributes without imposing semantic considerations. A session author MAY need to apply style or a uri attribute to some text that is otherwise no different than the text around it. This is also the only inline tag that MAY contain a child tag.

Child:

* <format> 0+

Attributes:

* core attributes plus uri 0

5.5.37. Tag

This tag indicates the content it contains is begging attention regardless of the importantce or relevance of the content in its given context.

Attributes:

* core attributes plus uri 0

5.5.38. <title> Tag

This element indicates either a person's official title or the title of a work.

Attributes:

* core attributes plus uri 0

6. Protocol Compatibility

It is important to determine if there is any interference to existing communication protocols imposed by the formal structuring of data. This section intends to determine if there are any incompatibilities with existing protocol standards and not whether existing services fail. It is anticipated there will likely be natural incompatibilities with existing technology that MAY perform sophisticated processing and relay of data across a network without expectation to uniformity to the definitions imposed upon that data.

Application oriented concerns not defined by this specification, especially vender-specific concerns, exceed the scope of this specification. If the standard imposed by this specification is not incompatible with existing standards it will be necessary for software vendors to modify their applications to ensure support of this technology without service interference.

This section will explore considerations for the gathering of data from a MML document necessary to conduct transportation of the document. This section is subdivided by mail distribution protocol.

6.1. Simple Mail Transfer Protocol (SMTP)

SMTP [RFC5321] is the backbone protocol of email distribution. This protocol is responsible for sending all email and often for receiving mail. In order to be compatible to the requirements of RFC 5321 (SMTP) RFC 5322 (Format) MUST be obsolete by this document. This specification seeks to replace RFC 5322 as the standard method for describing data in email.

RFC 5321 sets specific methods and requirements for the use of header fields from a mail document for use in defining transport and response necessary information. There is no guidance specified for precise movement of header information from a document to protocol use under any particular circumstances. The result is that MML processors MUST extract header information from the concerned header tags in a way that it deems most efficient and convenient to its logic so long as transport can be achieved in accordance with RFC 5321 and without harm to the document. Please see section 3. The SMTP Procedures: An Overview and Appendix B. Generating SMTP Commands from RFC 822 Headers from RFC 5321 for specific details.

6.2. Post Office Protocol - Version 3 (POP3)

POP3 [RFC1939] is incompatible with this specification due its section 11. Message Format. RFC 5322 is obsoleted by this document. POP3 is therefore incompatible by direct result of the following statement:

"All messages transmitted during a POP3 session are assumed to conform to the standard for the format of Internet text messages [RFC822]."
It is important to note that RFC 822 is obsoleted by RFC 5322.

The result is that RFC 1939 MUST be obsolete. If POP is to remain a standard it MUST be revised to either expect header information in MML specific format or be format non-specific.

6.3. Internet Message Access Protocol - Version 4rev1 (IMAP)

IMAP [RFC3501] is inherently dependant on formatting specified by RFC 5322, and so it MUST be rendered obsolete as a result.

6.4. Requirements for Web Mail

At this time of this writing Web Mail is inherently dependant upon POP3 and/or IMAP protocols. Since these protocols are rendered obsolete by this specification it can be assumed that MML is incompatible with web mail as it exists during the time of this writing.

In order for MML to be compatible with web mail the following conditions, beyond protocol compatibility, MUST be enforced:

* The containing document, such as a page of Extensible Hypertext Markup Language ((X)HTML), MUST be served, processed, and rendered as a subset of XML.

* The MML processor specific requirements specified in section 4. Processor Roles are REQUIRED.

* Components of the containing document, such as a page of (X)HTML, MUST NOT mix or interfere with the MML code. MML, and its subsets; if any, MUST exist as a preserved code island.

* MML MUST be sent without interference or supplication to its code or structure from its containing document, as a page of (X)HTML.

* Scripting that exists or is allowed by a containing document, such as a page of (X)HTML, MUST NOT be allowed to execute against the code, content, or structure imposed by the MML code island.

* MML presentation requirements MUST be enforced. Presentation from the containing document, such as a page of (X)HTML, MUST NOT act upon or interfere with presentation imposed by MML referenced stylesheets. The containing page MAY establish lowest priority default presentation exactly as a MML processor MAY do so.

* The containing document MUST be served only to the authorized user through an encrypted transmission.

* An XML compliant web browser SHOULD be capable of processing, presenting, and transmitting a MML document without any need for a containing document or any use of HTML or reformulation thereof.

7. Default mime.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xs:schema elementFormDefault="qualified" version="1.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:simpleType name="application-type">
    <xs:restriction base="xs:token">
      <xs:enumeration value="activemessage" />
      <xs:enumeration value="andrew-inset" />
      <xs:enumeration value="applefile" />
```

```
      <xs:enumeration value="atom+xml" />
      <xs:enumeration value="atomicmail" />
      <xs:enumeration value="atomcat+xml" />
      <xs:enumeration value="atomsvc+xml" />
      <xs:enumeration value="auth-policy+xml" />
      <xs:enumeration value="batch-SMTP" />
      <xs:enumeration value="beep+xml" />
      <xs:enumeration value="cals-1840" />
      <xs:enumeration value="ccxml+xml" />
      <xs:enumeration value="cellml+xml" />
      <xs:enumeration value="cnrp+xml" />
      <xs:enumeration value="commonground" />
      <xs:enumeration value="conference-info+xml" />
      <xs:enumeration value="cpl+xml" />
      <xs:enumeration value="csta+xml" />
      <xs:enumeration value="CSTAdata+xml" />
      <xs:enumeration value="cybercash" />
      <xs:enumeration value="davmount+xml" />
      <xs:enumeration value="dca-rft" />
      <xs:enumeration value="dec-dx" />
      <xs:enumeration value="dialog-info+xml" />
      <xs:enumeration value="dicom" />
      <xs:enumeration value="dns" />
      <xs:enumeration value="dvcs" />
      <xs:enumeration value="ecmascript" />
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      <xs:enumeration value="MPV" />
      <xs:enumeration value="mpeg" />
      <xs:enumeration value="mpeg4-generic" />
      <xs:enumeration value="nv" />
      <xs:enumeration value="ogg" />
      <xs:enumeration value="parityfec" />
      <xs:enumeration value="pointer" />
      <xs:enumeration value="quicktime" />
      <xs:enumeration value="raw" />
      <xs:enumeration value="rtp-enc-aescm128" />
      <xs:enumeration value="rtx" />
      <xs:enumeration value="SMTPE292M" />
      <xs:enumeration value="ulpfec" />
      <xs:enumeration value="vc1" />
      <xs:enumeration value="vnd.CCTV" />
      <xs:enumeration value="vnd.dlna.mpeg-tts" />
      <xs:enumeration value="vnd.fvt" />
      <xs:enumeration value="vnd.hns.video" />
      <xs:enumeration value="vnd.iptvforum.1dparityfec-1010" />
      <xs:enumeration value="vnd.iptvforum.1dparityfec-2005" />
      <xs:enumeration value="vnd.iptvforum.2dparityfec-1010" />
      <xs:enumeration value="vnd.iptvforum.2dparityfec-2005" />
      <xs:enumeration value="vnd.iptvforum.ttsavc" />
      <xs:enumeration value="vnd.iptvforum.ttsmpeg2" />
      <xs:enumeration value="vnd.motorola.video" />
      <xs:enumeration value="vnd.motorola.videop" />
      <xs:enumeration value="vnd.mpegurl" />
      <xs:enumeration value="vnd.ms-playready.mediapyv" />
      <xs:enumeration value="vnd.nokia.interleaved-multimedia" />
      <xs:enumeration value="vnd.nokia.videovoip" />
      <xs:enumeration value="vnd.objectvideo" />
```

```
      <xs:enumeration value="vnd.sealed.mpeg1" />
      <xs:enumeration value="vnd.sealed.mpeg4" />
      <xs:enumeration value="vnd.sealed.swf" />
      <xs:enumeration value="vnd.sealedmedia.softseal.mov" />
      <xs:enumeration value="vnd.vivo" />
    </xs:restriction>
  </xs:simpleType>
  <xs:group name="super-types">
    <xs:choice>
      <xs:element name="application" type="application-type" />
      <xs:element name="audio" type="audio-type" />
      <xs:element name="example" type="example-type" />
      <xs:element name="image" type="image-type" />
      <xs:element name="message" type="message-type" />
      <xs:element name="model" type="model-type" />
      <xs:element name="multipa t" type="multipart-type" />
      <xs:element name="text" type="text-type" />
      <xs:element name="video" type="video-type" />
    </xs:choice>
  </xs:group>
  <xs:complexType name="mime-type">
    <xs:group ref="super-types" />
  </xs:complexType>
</xs:schema>
```

8. MML Schema

```
<?xml version="1.0" encoding="utf-8"?><xs:schema
  xmlns:xfm="http://www.w3.org/2002/xforms" version="1.0"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"><xs:import
  schemaLocation="http://www.w3.org/MarkUp/Forms/2002/XForms-Schema.xsd"
  namespace="http://www.w3.org/2002/xforms" /><xs:import
  schemaLocation="http://www.w3.org/2001/XMLSchema.xsd"
  namespace="http://www.w3.org/2001/XMLSchema" />
  <xs:include schemaLocation="http://mailmarkup.org/mime.xsd" />
  <xs:element name="mail">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="session" />
      </xs:sequence>
      <xs:attribute ref="mail-type" use="required" />
      <xs:attribute ref="version" use="required" />
    </xs:complexType>
  </xs:element>
  <xs:attribute fixed="application/mail+xml" name="mail-type" />
  <xs:attribute fixed="1.1" name="version" />
  <xs:element name="session">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="address" />
        <xs:element minOccurs="0" ref="attachments" />
        <xs:element ref="subject" />
```

```
        <xs:element minOccurs="0" ref="presentation" />
        <xs:choice>
          <xs:element ref="source" />
          <xs:element ref="plain-text" />
          <xs:element ref="markup" />
        </xs:choice>
      </xs:sequence>
      <xs:attribute ref="time-stamp" use="required" />
      <xs:attribute default="en" ref="language" use="optional" />
    </xs:complexType>
  </xs:element>
  <xs:attribute name="time-stamp">
    <xs:simpleType>
      <xs:restriction base="xs:dateTime" />
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="language">
    <xs:simpleType>
      <xs:restriction base="xs:language" />
    </xs:simpleType>
  </xs:attribute>
  <xs:element name="address">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" name="to" type="agent" />
        <xs:element minOccurs="0" maxOccurs="unbounded" name="copy"
          type="agent" />
        <xs:element minOccurs="0" maxOccurs="unbounded"
          name="blind-copy" type="agent" />
        <xs:element name="from" type="agent" />
        <xs:element ref="reply-to" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="reply-to">
    <xs:complexType>
      <xs:simpleContent>
        <xs:extension base="reply-type">
          <xs:attribute ref="alias" use="optional" />
          <xs:attribute ref="public-key" use="optional" />
        </xs:extension>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:simpleType name="reply-type">
    <xs:restriction base="xs:anyURI">
      <xs:pattern
     value="\c+(\.\c)*@\c+(\.\c)*(\.[a-z]{2,3})|([a-z]{2}\.[a-z]{2})" />
      <xs:pattern value="no-reply" />
    </xs:restriction>
  </xs:simpleType>
```

```
  <xs:complexType name="agent">
    <xs:simpleContent>
      <xs:extension base="email">
        <xs:attribute ref="alias" use="optional" />
        <xs:attribute ref="public-key" use="optional" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:simpleType name="email">
    <xs:restriction base="xs:anyURI">
      <xs:pattern
        value="\w+(\.\w)*@\w+(\.\w)*(\.[\w]{2,3})|([\w]{2}\.[\w]{2})" />
    </xs:restriction>
  </xs:simpleType>
  <xs:attribute name="alias">
    <xs:simpleType>
      <xs:restriction base="xs:token" />
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="public-key">
    <xs:simpleType>
      <xs:restriction base="xs:QName">
        <xs:pattern value="[A-Z0-9]+\:\w+"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:element name="attachments">
    <xs:complexType>
      <xs:choice maxOccurs="unbounded">
        <xs:element ref="collection" />
        <xs:element ref="file" />
      </xs:choice>
    </xs:complexType>
  </xs:element>
  <xs:element name="collection">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="collection-name" />
        <xs:element maxOccurs="unbounded" ref="collection-file" />
        <xs:element minOccurs="0" ref="collection-type" />
        <xs:element ref="collection-description" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="collection-name">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
```

```
  <xs:element name="collection-file">
    <xs:simpleType>
      <xs:restriction base="xs:NCName">
        <xs:pattern value="\c+(\.\c+)+"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="collection-type" type="mime-type" />
  <xs:element name="collection-description">
    <xs:simpleType>
      <xs:restriction base="xs:normalizedString">
        <xs:minLength value="3" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="file">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="file-name" />
        <xs:element ref="file-type" />
        <xs:element ref="file-description" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="file-name">
    <xs:simpleType>
      <xs:restriction base="xs:NCName">
        <xs:pattern value="\c+(\.\c+)+" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="file-type" type="mime-type" />
  <xs:element name="file-description">
    <xs:simpleType>
      <xs:restriction base="xs:normalizedString" />
    </xs:simpleType>
  </xs:element>
  <xs:element name="subject">
    <xs:simpleType>
      <xs:restriction base="xs:normalizedString">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="presentation">
    <xs:complexType>
      <xs:sequence maxOccurs="unbounded">
        <xs:element ref="stylesheet" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
```

```
  <xs:element name="stylesheet">
    <xs:complexType>
      <xs:simpleContent>
        <xs:extension base="xs:anyURI">
          <xs:attribute ref="style-namespace" use="required" />
          <xs:attribute ref="style-type" use="required" />
          <xs:attribute default="screen" ref="media" use="optional" />
        </xs:extension>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:attribute name="style-type">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="application/xslt+xml" />
        <xs:enumeration value="text/css" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="style-namespace">
    <xs:simpleType>
      <xs:restriction base="xs:ID">
        <xs:pattern value="\w+" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="media">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="all" />
        <xs:enumeration value="aural" />
        <xs:enumeration value="braille" />
        <xs:enumeration value="embossed" />
        <xs:enumeration value="handheld" />
        <xs:enumeration value="print" />
        <xs:enumeration value="projection" />
        <xs:enumeration value="screen" />
        <xs:enumeration value="tty" />
        <xs:enumeration value="tv" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:element name="source">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="source-uri" />
        <xs:element ref="source-type" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="source-uri">
```

```
    <xs:simpleType>
      <xs:restriction base="xs:anyURI">
        <xs:minLength value="5" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="source-type" type="mime-type" />
  <xs:element name="plain-text">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:minLength value="5" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="markup">
    <xs:complexType>
      <xs:sequence>
        <xs:choice maxOccurs="unbounded">
          <xs:group ref="complex-blocks" />
          <xs:group ref="simple-blocks" />
          <xs:any namespace="##other" processContents="lax" />
        </xs:choice>
      </xs:sequence>
      <xs:anyAttribute namespace="xmlns" />
    </xs:complexType>
  </xs:element>
  <xs:attributeGroup name="core-attrs">
    <xs:attribute ref="id" use="optional" />
    <xs:attribute ref="style" use="optional" />
    <xs:attribute ref="title" use="optional" />
    <xs:attribute ref="role" use="optional" />
  </xs:attributeGroup>
  <xs:attributeGroup name="core-attrs-uri">
    <xs:attribute ref="id" use="optional" />
    <xs:attribute ref="style" use="optional" />
    <xs:attribute ref="title" use="optional" />
    <xs:attribute ref="role" use="optional" />
    <xs:attribute ref="uri" use="optional" />
  </xs:attributeGroup>
  <xs:attributeGroup name="inter-attrs">
    <xs:attribute default="tl" ref="direction" use="optional" />
    <xs:attribute default="horizontal" ref="orientation"
      use="optional" />
    <xs:attribute default="standard" ref="wrap" use="optional" />
    <xs:attribute default="en" ref="section-language" use="optional" />
  </xs:attributeGroup>
  <xs:attributeGroup name="cell-attrs">
    <xs:attribute default="1" ref="span-column" use="optional" />
    <xs:attribute default="1" ref="span-row" use="optional" />
  </xs:attributeGroup>
  <xs:attribute name="id">
```

```
    <xs:simpleType>
      <xs:restriction base="xs:ID">
        <xs:minLength value="2" />
        <xs:pattern value="\w+" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="style">
    <xs:simpleType>
      <xs:restriction base="xs:QName">
        <xs:minLength value="4" />
        <xs:pattern value="\w+\:\w+" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="title">
    <xs:simpleType>
      <xs:restriction base="xs:normalizedString">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="role">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="uri">
    <xs:simpleType>
      <xs:restriction base="xs:anyURI">
        <xs:minLength value="5" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="direction">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="tl" />
        <xs:enumeration value="br" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="orientation">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="horizontal" />
        <xs:enumeration value="vertical" />
      </xs:restriction>
    </xs:simpleType>
```

```
  </xs:attribute>
  <xs:attribute name="wrap">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="standard" />
        <xs:enumeration value="reverse" />
        <xs:enumeration value="none" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="section-language">
    <xs:simpleType>
      <xs:restriction base="xs:language">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="refer">
    <xs:simpleType>
      <xs:restriction base="xs:IDREF">
        <xs:minLength value="2" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="span-column">
    <xs:simpleType>
      <xs:restriction base="xs:positiveInteger" />
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="span-row">
    <xs:simpleType>
      <xs:restriction base="xs:positiveInteger" />
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="scope">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:enumeration value="column" />
        <xs:enumeration value="row" />
        <xs:enumeration value="group-column" />
        <xs:enumeration value="group-row" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="long-form">
    <xs:simpleType>
      <xs:restriction base="xs:token">
        <xs:minLength value="5" />
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
```

```
  <xs:group name="complex-blocks">
    <xs:choice>
      <xs:group ref="list-group" />
      <xs:element ref="table" />
      <xs:element ref="section" />
      <xs:element ref="form" />
    </xs:choice>
  </xs:group>
  <xs:group name="simple-blocks">
    <xs:choice>
      <xs:element ref="block-code" />
      <xs:element ref="block-quote" />
      <xs:element ref="citation" />
      <xs:element ref="heading" />
      <xs:element ref="object" />
      <xs:element ref="paragraph" />
      <xs:element ref="separator" />
    </xs:choice>
  </xs:group>
  <xs:complexType name="simple-blocks-type" mixed="true">
    <xs:group minOccurs="0" maxOccurs="unbounded" ref="inline" />
    <xs:attributeGroup ref="core-attrs" />
    <xs:attributeGroup ref="inter-attrs" />
  </xs:complexType>
  <xs:group name="inline">
    <xs:choice>
      <xs:group ref="xfm:Form.Controls" />
      <xs:element ref="short" />
      <xs:element ref="button" />
      <xs:element ref="cite" />
      <xs:element ref="emphasis" />
      <xs:element ref="identifier" />
      <xs:element ref="quote" />
      <xs:element ref="format" />
      <xs:element ref="strong" />
      <xs:element ref="title" />
    </xs:choice>
  </xs:group>
  <xs:group name="object-group">
    <xs:sequence>
      <xs:element ref="object-text" />
      <xs:element ref="object-uri" />
      <xs:element ref="object-type" />
      <xs:group minOccurs="0" maxOccurs="unbounded" ref="inline" />
    </xs:sequence>
  </xs:group>
  <xs:complexType name="inline-base">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attributeGroup ref="core-attrs-uri" />
      </xs:extension>
```

```
    </xs:simpleContent>
  </xs:complexType>
  <xs:complexType name="inline-type">
    <xs:simpleContent>
      <xs:restriction base="inline-base">
        <xs:minLength value="1" />
      </xs:restriction>
    </xs:simpleContent>
  </xs:complexType>
  <xs:complexType name="format-type" mixed="true">
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="format" />
    </xs:sequence>
    <xs:attributeGroup ref="core-attrs-uri" />
  </xs:complexType>
  <xs:group name="list-group">
    <xs:choice>
      <xs:element ref="define-list" />
      <xs:element ref="navigation-list" />
      <xs:element ref="order-list" />
      <xs:element ref="unorder-list" />
    </xs:choice>
  </xs:group>
  <xs:complexType name="nesting-block">
    <xs:choice maxOccurs="unbounded">
      <xs:group ref="complex-blocks" />
      <xs:group ref="simple-blocks" />
    </xs:choice>
  </xs:complexType>
  <xs:element name="define-list">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="define-item" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="define-item">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="define-term" />
        <xs:element maxOccurs="unbounded" ref="definition" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="define-term">
    <xs:complexType>
      <xs:simpleContent>
        <xs:extension base="xs:normalizedString">
          <xs:attributeGroup ref="core-attrs-uri" />
```

```
          <xs:attributeGroup ref="inter-attrs" />
        </xs:extension>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:element name="definition">
    <xs:complexType mixed="true">
      <xs:group minOccurs="0" maxOccurs="unbounded" ref="inline" />
      <xs:attributeGroup ref="core-attrs" />
      <xs:attributeGroup ref="inter-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="navigation-list">
    <xs:complexType>
      <xs:sequence>
        <xs:choice minOccurs="0">
          <xs:element ref="heading" />
          <xs:element ref="identifier" />
        </xs:choice>
        <xs:element maxOccurs="unbounded" ref="navigation-item" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="navigation-item">
    <xs:complexType>
      <xs:choice>
        <xs:element ref="navigation-object" />
        <xs:element ref="navigation-text" />
      </xs:choice>
      <xs:attributeGroup ref="core-attrs" />
      <xs:attribute ref="uri" use="required" />
    </xs:complexType>
  </xs:element>
  <xs:element name="navigation-object">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="object-text" />
        <xs:element ref="object-uri" />
        <xs:element ref="object-type" />
      </xs:sequence>
      <xs:attributeGroup ref="inter-attrs" />
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="object-text">
    <xs:simpleType>
      <xs:restriction base="xs:normalizedString">
        <xs:minLength value="3" />
      </xs:restriction>
    </xs:simpleType>
```

```
  </xs:element>
  <xs:element name="object-uri">
    <xs:simpleType>
      <xs:restriction base="xs:anyURI" />
    </xs:simpleType>
  </xs:element>
  <xs:element name="object-type" type="mime-type" />
  <xs:element name="navigation-text">
    <xs:complexType>
      <xs:simpleContent>
        <xs:extension base="xs:string">
          <xs:attributeGroup ref="inter-attrs" />
          <xs:attributeGroup ref="core-attrs" />
        </xs:extension>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:element name="order-list">
    <xs:complexType>
      <xs:sequence>
        <xs:choice minOccurs="0">
          <xs:element ref="heading" />
          <xs:element ref="identifier" />
        </xs:choice>
        <xs:element maxOccurs="unbounded" ref="list-item" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="unorder-list">
    <xs:complexType>
      <xs:sequence>
        <xs:choice minOccurs="0">
          <xs:element ref="heading" />
          <xs:element ref="identifier" />
        </xs:choice>
        <xs:element maxOccurs="unbounded" ref="list-item" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="list-item">
    <xs:complexType mixed="true">
      <xs:choice>
        <xs:group ref="simple-blocks" />
        <xs:group maxOccurs="unbounded" ref="inline" />
      </xs:choice>
      <xs:attributeGroup ref="core-attrs" />
      <xs:attributeGroup ref="inter-attrs" />
    </xs:complexType>
  </xs:element>
```

```
  <xs:element name="form">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="xfm:model" />
        <xs:element ref="form-body" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="form-body">
    <xs:complexType>
      <xs:choice maxOccurs="unbounded">
        <xs:group ref="list-group" />
        <xs:group ref="simple-blocks" />
        <xs:group ref="xfm:UI.Common" />
        <xs:element ref="table" />
      </xs:choice>
    </xs:complexType>
  </xs:element>
  <xs:element name="table">
    <xs:complexType>
      <xs:sequence>
        <xs:element minOccurs="0" ref="head-row" />
        <xs:element maxOccurs="unbounded" ref="table-row" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="head-row">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" ref="head-cell" />
      </xs:sequence>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="head-cell">
    <xs:complexType mixed="true">
      <xs:choice>
        <xs:group ref="simple-blocks" />
        <xs:group maxOccurs="unbounded" ref="inline" />
      </xs:choice>
      <xs:attribute default="column" ref="scope" use="optional" />
      <xs:attributeGroup ref="cell-attrs" />
      <xs:attributeGroup ref="core-attrs" />
      <xs:attributeGroup ref="inter-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="table-row">
    <xs:complexType>
      <xs:choice maxOccurs="unbounded">
        <xs:element ref="head-cell" />
```

```
        <xs:element ref="table-cell" />
      </xs:choice>
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="table-cell">
    <xs:complexType mixed="true">
      <xs:choice>
        <xs:group ref="simple-blocks" />
        <xs:group maxOccurs="unbounded" ref="inline" />
      </xs:choice>
      <xs:attributeGroup ref="cell-attrs" />
      <xs:attributeGroup ref="core-attrs" />
      <xs:attributeGroup ref="inter-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="section">
    <xs:complexType>
      <xs:complexContent mixed="false">
        <xs:extension base="nesting-block">
          <xs:attributeGroup ref="core-attrs" />
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>
  <xs:element name="block-code" type="simple-blocks-type" />
  <xs:element name="block-quote" type="simple-blocks-type" />
  <xs:element name="citation">
    <xs:complexType mixed="true">
      <xs:group minOccurs="0" maxOccurs="unbounded" ref="inline" />
      <xs:attribute ref="id" use="required" />
      <xs:attribute ref="style" use="optional" />
      <xs:attribute ref="title" use="optional" />
      <xs:attribute ref="role" use="optional" />
      <xs:attributeGroup ref="inter-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="heading" type="simple-blocks-type" />
  <xs:element name="object">
    <xs:complexType>
      <xs:group ref="object-group" />
      <xs:attributeGroup ref="inter-attrs" />
      <xs:attributeGroup ref="core-attrs" />
    </xs:complexType>
  </xs:element>
  <xs:element name="paragraph" type="simple-blocks-type" />
  <xs:element name="separator" type="simple-blocks-type" />
  <xs:complexType name="short-type">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute ref="long-form" use="required" />
```

```
        <xs:attributeGroup ref="core-attrs-uri" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:element name="short">
    <xs:complexType>
      <xs:simpleContent>
        <xs:restriction base="short-type">
          <xs:minLength value="1" />
          <xs:whiteSpace value="collapse" />
        </xs:restriction>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="button-type">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute ref="refer" use="optional" />
        <xs:attributeGroup ref="core-attrs-uri" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:element name="button">
    <xs:complexType>
      <xs:simpleContent>
        <xs:restriction base="button-type">
          <xs:minLength value="1" />
          <xs:whiteSpace value="collapse" />
        </xs:restriction>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="cite-type">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute ref="refer" use="required" />
        <xs:attributeGroup ref="core-attrs" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:element name="cite">
    <xs:complexType>
      <xs:simpleContent>
        <xs:restriction base="cite-type">
          <xs:minLength value="1" />
          <xs:whiteSpace value="collapse" />
        </xs:restriction>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:element name="emphasis" type="inline-type" />
```

```
  <xs:complexType name="identifier-type">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute ref="refer" use="required" />
        <xs:attributeGroup ref="core-attrs-uri" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:element name="identifier">
    <xs:complexType>
      <xs:simpleContent>
        <xs:restriction base="identifier-type">
          <xs:minLength value="1" />
          <xs:whiteSpace value="collapse" />
        </xs:restriction>
      </xs:simpleContent>
    </xs:complexType>
  </xs:element>
  <xs:element name="quote" type="inline-type" />
  <xs:element name="format" type="format-type" />
  <xs:element name="strong" type="inline-type" />
  <xs:element name="title" type="inline-type" />
  <xs:annotation>
    <xs:documentation>
    Mail Markup Language, MML, is a method of structuring, defining, and
    describing content and data in email for a variety of reasons.
    Please refer to http://mailmarkup.org for more information.  First
    implementation begun by Austin Cheney on 12 October 2007.
    </xs:documentation>
  </xs:annotation>
</xs:schema>
```

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