MIME (Multipurpose Internet Mail Extensions)

Introduction to MIME

MIME (*Multipurpose Internet Mail Extensions*) is a standard which was proposed by Bell Communications in 1991 in order to expand upon the limited capabilities of email, and in particular to allow documents (such as images, sound, and text) to be inserted in a message. It was originally defined by RFCs 1341 and 1342 in June 1992.

Using headers, MIME describes the type of message content and the encoding used.

MIME adds the following features to email service:

- Be able to send multiple attachments with a single message;
- Unlimited message length;
- Use of character sets other than ASCII code;
- Use of rich text (layouts, fonts, colors, etc)
- Binary attachments (executables, images, audio or video files, etc.), which may be divided if needed.

MIME uses special header directives to describe the format used in a message body, so that the email client can interpret it correctly:

- MIME-Version: This is the version of the MIME standard used in the message. Currently only version 1.0 exists.
- Content-type: Describes the data's type and subtype. It can include a "charset" parameter, separated by a semi-colon, defining which character set to use.
- Content-Transfer-Encoding: Defines the encoding used in the message body
- Content-ID: Represents a unique identification for each message segment
- Content-Description: Gives additional information about the message content.
- Content-Disposition: Defines the attachment's settings, in particular the name associated with the file, using the attribute *filename*.

Primary MIME types

MIME types, used in the *Content-Type* header, are used to classify documents attached to an email. A MIME type is comprised as follows:
Content-**type:** main_mime_type/mime_subtype
A GIF image, for example, has the following MIME type:
Content-**type:** image/gif

The primary data types, sometimes called "discrete data types," are:

- **text**: readable text data text/rfc822 [RFC822]; text/plain [RFC2646]; text/html [RFC2854] .
- image: binary data representing digital images: image/jpeg; image/gif; image/png.
- **audio**: digital sound data: audio/basic; audio/wav
- **video**: video data: video/mpeg
- **application**: Other binary data: application/octet-stream; application/pdf

MIME types are also used on the Web to classify documents transferred using the protocol HTTP. Thus during a transaction between a web server and a browser, the first thing the web server does is send the MIME type of the file to the browser, so that the browser knows how to display the document.

Encoding formats

To transfer binary data, MIME offers five encoding formats which can be used in the header *transfer-encoding*:

- **7bit**: 7-bit text format (for messages without accented characters);
- **8bit**: 8-bit text format;
- **quoted-printable**: Quoted-Printable format, recommended for messages which use a 7-bit alphabet (such as when there are accent marks);
- **base64**: Base 64, recommended for sending binary files as attachments;
- **binary**: binary format; not recommended.

Since MIME is very open, it can use third-party encoding formats such as:

- BinHex (a proprietary format belonging to Apple),
- uuencode,
- xxencode

Header encoding

The *transfer-encoding* header is used to specify an encoding format for the message body, but it doesn't solve the problem of encoding headers themselves (such as the message subject).

To encode headers with character sets which use more than 7 bits, such as for including accented letters in an email's subject, the MIME standard offers the following format:

=?**charset**?**encoding**?**result**?=

- **charset** represents the character set used,
- **encoding** defines the encoding desired with two possible values:

- Q for quoted-printable
- B for base64

- result: text encoded using the method specified.

Below is an example of Quoted-Printable encoding with "Building faÃ§ade" as the email's subject.
Subject: Building fa=?ISO-8859-1?Q?=E7ade?=

Composite messages

With the MIME type "multipart", the MIME standard allows for composite messages, meaning messages which include multiple attachments, which may even be nested.

To do so, MIME allows for a standard called *boundary*. This is an arbitrary string defined as an attribute in the *Content-type* header:
Content-**Type**: multipart/mixed;
boundary="------------020005090303070203010601"
Each separator delimits a portion of content beginning with the headers *Content-Type* and *Content-Encoding*. It is essential that the value of this separator is not found within the message contents.
There are several types of separators:

- multipart/mixed defines a series of multiple elements
- multipart/alternative defines alternatives for the same information, such as a message in either text and HTML format. If the email client is able to display messages with a layout and configured to do so, it will show the HTML version; otherwise, it will display the test version.
- multipart/parallel defines data present at the same time (such as sound and image).
- multipart/signed defines a digital signature for message data
- multipart/related defines related pieces of information

List of MIME types

MIME types are standardized by a group called the **IANA** (*Internet Assigned Numbers Authority*). Here is a non-exhaustive list of the most common MIME types.

MIME Type	**Type of file**	**Associated extension**
application/atom+xml	Files in ATOM format	atom
application/iges	CAS files	iges

application/javascript	JavaScript files	js
application/dxf	AutoCAD files	dxf
application/mp4	MPEG4 files	mp4
application/iges	IGES CAD exchange format	igs,iges
application/octet-stream	Non-interpreted binary files	bin
application/msword	Microsoft Word document files	doc
application/pdf	Adobe Acrobat files	pdf
application/postscript	PostScript files	ai,eps,ps
application/rtf	Rich text format	rtf
application/sgml	SGML files	sgml
application/vnd.ms-excel	Microsoft Excel spreadsheet files	xls
application/vnd.ms-powerpoint	Microsoft Powerpoint presentation files	ppt
application/xml	XML file	xml
application/x-tar	Compressed tar files	tar
application/zip	Compressed ZIP files	man
audio/basic	Basic audio files	au,snd
audio/mpeg	MPEG audio files	mpg,mp3
audio/mp4	MPEG-4 audio files	mp4
audio/x-aiff	AIFF audio files	aif,aiff,aifc
audio/x-wav	Wave audio files	wav
image/gif	Gif images	man
image/jpeg	Jpeg images	jpg,jpeg,jpe
image/png	Images PNG	png
image/tiff	Tiff images	tiff,tif
image/x-portable-bitmap	PBM Bitmap files	pbm
image/x-portable-graymap	PBM Graymap files	pgm
image/x-portable-pixmap	PBM Pixmap files	ppm

multipart/x-zip	Zip archive files	zip
multipart/x-gzip	GNU zip archive files	gz,gzip
text/css	Style sheet	css
text/csv	Comma-separated text files	csv
text/html	HTML files	htm,html
text/plain	Unformatted text files	txt,g,h,c,cc,hh,m,f90
text/richtext	Rich text files	rtx
text/rtf	Rich Text Format text files	rtf
text/tab-separated-value	Tab-separated text files	tsv
text/xml	XML files	xml
video/h264	H.264 videos	h264
video/dv	DV videos	dv
video/mpeg	MPEG videos	mpeg,mpg,mpe
video/quicktime	QuickTime videos	qt,mov
video/msvideo	Microsoft Windows videos	avi

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