

INTERNET-DRAFT  
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June 20, 1999

**Waveform Audio File Format**  
**MIME Sub-type Registration**  
<[draft-ema-vpim-wav-00.txt](#)>

Status of this memo:

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This draft is being discussed by the Electronic Messaging Association VPIM work group. To subscribe to the mailing list, send a message to EMA Listserv Requests [[listserv@listmail.ema.org](mailto:listserv@listmail.ema.org)] with the line "subscribe VPIM-L" in the body of the message.

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## Abstract

This document describes the registration of the MIME sub-type audio/wav for Waveform Audio File Format. This audio file format is based on RIFF and is defined by Microsoft in the Platform SDK.

## 1. Introduction

**This document describes the registration of the MIME sub-type audio/wav for the encapsulation of toll-quality audio in the Waveform Audio File Format. This audio file format is based on Resource Interchange File Format (RIFF), and is defined by Microsoft in the Platform SDK.**

The MIME subtype "wav" is being defined primarily for use in multimedia and voice messaging standards. the Voice Profile for Internet Messaging, version 3 [[VPIM3](#)] working draft specifies that all VPIM version 3 compliant implementations MAY generate audio/wav bodyparts and MUST receive audio/wav bodyparts. The VPIM version 3 specification further states that all compliant implementations MUST support receipt of wav-encapsulated 32KADPCM (g.726 ADPCM), BASIC (g.711 mu-law), and MS-GSM (Microsoft g.610 GSM) encoded audio.

Because the Waveform Audio File format is not well-defined and has not undergone a process of standardization, this document briefly defines the format that will be supported by VPIM version 3. For more detailed information, refer to the specification.

This document does not obsolete the informational draft [RFC 2361 \[WAVE\]](#) which describes audio/vnd.wav. Whereas [RFC 2361](#) describes a mechanism for indicating a codec registered in the wav or avi vendor tree registries, this document proposes a standard for specifying wav-encapsulated audio content in a MIME stream.

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 [[REQ](#)].

## 2. WAV Definition

Waveform Audio File Format is a file format for the storing of audio data in data chunks according to the Resource Interchange File Format (RIFF). Although the Waveform format is described in detail in xxxxxxxx, lack of standardization and a proliferation of interpretations and enhancements make the format difficult to implement and support in an interoperable fashion. This document seeks to rectify the situation by defining the Waveform Audio File Format features that MUST be implemented and supported for

conformance with the proposed VPIM version 3 standard.

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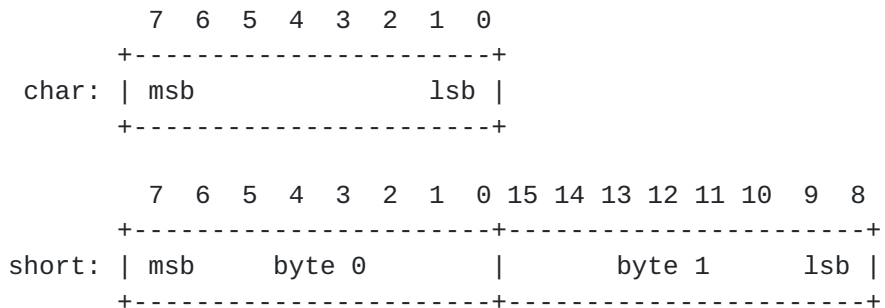
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## 2.1 Data Organization

**Data MUST be stored in 8-bit bytes in little-endian order.**

Multi-byte values MUST be stored with the low-order bytes first, and the bits left-justified:

(lsb = least-significant bit, msb = most-significant bit)



## 2.2 File Format

**The Waveform Audio File Format follows the Resource Interchange File Format (RIFF) standard** in which all data is organized into 'chunks' and 'sub-chunks.' Each chunk MUST comprise a 4-byte chunk ID, a 4-byte length field specifying the size of the data, and the chunk data.

To be compliant with this proposed standard, wav-formatted audio data MUST include the following chunks:

```

RIFF header chunk: ID = 'RIFF'
Format chunk:      ID = 'fmt '
Sound data chunk:  ID = 'data'
Fact chunk:        ID = 'fact'

```

The chunks MAY appear in any order except that the Format chunk MUST be placed before the Sound data chunk (but not necessarily contiguous to the Sound data chunk). Any additional chunks MUST be expected and MAY be ignored.

### 2.2.1 The RIFF Header Chunk

**The RIFF header corresponds to the outermost chunk. In an audio/wav file, it MUST adhere to the following format:**

OFFSET	LENGTH	VALUE	DESCRIPTION
0	4 bytes	'RIFF'	The file format ID.
4	4 bytes		Length of the file minus (-) 8 bytes.
8	4 bytes	'WAVE'	The data format ID.

### 2.2.2 The Format Chunk

**The Format chunk specifies the characteristics of the audio data** necessary to decompress it and play it. Each audio/wav file MUST include one and only one Format chunk. This chunk MUST include

the following fields:

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OFFSET	LENGTH	VALUE	DESCRIPTION
12	4 bytes	'fmt '	The chunk ID.
16	4 bytes	32	Length of the chunk excluding the 8 bytes for the ID and length.
20	4 bytes		The codec ID.
24	4 bytes		The number of channels.
28	8 bytes		Samples per second.
36	8 bytes		Average bytes per second.
44	4 bytes		Block alignment.
48	4 bytes		Bits per sample.

Codec ID: The codec ID indicates what codec was used to compress the audio data. Three codecs are supported by the proposed VPIM version 3 standard, and one of them SHOULD be specified in the Codec ID field. The Codec ID field MAY indicate a codec other than the three listed below only in situations where it is certain that the recipient has the corresponding capabilities.

CODEC	ID
g.711 mu-law	0x0007
g.610 MS-GSM	0x0031
g.726 32kADPCM	0x0064

Number of Channels: To preserve network bandwidth and minimize memory requirements, the Format chunk SHOULD specify and the Data chunk SHOULD provide only one channel (mono) unless it is certain that the recipient supports multi-channel playback.

CHANNELS	VALUE
one (mono)	1

Samples per Second: This field indicates the rate at which the audio is to be played (once uncompressed), expressed in sample frames per second. The following table specifies the samples per second that correspond to each VPIM version 3 codec:

CODEC	RATE (samples per second)
g.711 mu-law	8000
g.610 MS-GSM	8000
g.726 32kADPCM	8000

Average Bytes per Second: This field specifies the number of bytes that play per second. It provides an indication of the buffer size needed to store the audio in order to avoid latency. It SHOULD be calculated according to the following formula: samples/second \* block alignment (rounded up to nearest whole number).

CODEC	RATE (average bytes per second)
-------	---------------------------------

g.711 mu-law	8000
g.610 MS-GSM	1625
g.726 32kADPCM	4000

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**Block Alignment:** This field indicates the size of a sample frame in bytes. It SHOULD be calculated according to the following formula: number of channels \* (bits per sample / 8)

CODEC	SIZE
g.711 mu-law	1
g.610 MS-GSM	65
g.726 32kADPCM	2

since there are 4 bits per sample, the frames will not align on one byte. It is customary to add silence bits (0xF) to the end of the sample to make the frame end on a byte boundary.

**Bits per Sample:** This field specifies the bit resolution of a sample point.

CODEC	BITS (bits per sample)
g.711 mu-law	8
g.610 MS-GSM	0
g.726 32kADPCM	4

data immediately followed by: 0x40 0x01

### **2.2.3 The Data Chunk**

**The Data chunk contains the compressed audio data. This chunk MUST be preceded (though not immediately) by the Format chunk. The Data chunk MUST adhere to the following format:**

OFFSET	LENGTH	VALUE	DESCRIPTION
52	4 bytes	'data'	The chunk ID.
56	4 bytes		Length of the data (chunk size minus (-) 8 bytes.
60			The compressed audio.

### **2.2.4 The Fact Chunk**

**All audio/wav files MUST include a Fact chunk as they contain compressed data. The Fact chunk MUST contain one field indicating the size (in sample points) of the audio data after decompression. The Fact chunk MUST adhere to the following format:**

OFFSET	LENGTH	VALUE	DESCRIPTION
	4 bytes	'fact'	The chunk ID.
	4 bytes	8	Chunk size minus (-) 8 bytes.
	8 bytes		Sample length.

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### **3. MIME Definition**

#### **3.1 audio/wav**

[Specification] describes a file format for the encapsulation of raw and compressed audio data. This Waveform Audio File Format (WAVE) is based on the Resource Interchange File Format specification developed by Microsoft and IBM in 1991. The WAVE format organizes audio data and the information needed to decompress and play it in chunks.

The MIME sub-type audio/WAV is defined to hold binary audio data encoded in 32 kbit/s ADPCM (g.726), mu-law (g.711), or MS-GSM (g.610), and encapsulated in the WAVE format. The content transfer encoding is typically either binary or base64.

#### **3.2 VPIM Usage**

The audio/wav sub-type is a component of the proposed VPIM version 3 specification [[VPIM3](#)]. In this context, the Content-Description headers is used to succinctly describe the contents of the audio body.

All VPIM Version 3 systems MUST be capable of receiving audio encapsulated in a WAVE file format. Sending systems MAY choose to send raw audio data or encapsulate it in the WAVE file format. All audio data MUST be compressed in one of the VPIM v3 codecs and encapsulated according to the guidelines provided in the [section 2.0](#) of this document.

Refer to the VPIM Specification for proper usage.

#### **3.3 Relation to [RFC 2361](#)**

[RFC 2361](#), "WAVE and AVI Codec Registries," is an informational draft describing IANA namespaces for codecs registered in Microsoft's WAVE and AVI registries. Such codecs may be described in the following format: audio/vnd.wave; codec = [codec ID]. This format is not suited to the description of a wave file as defined in this document, as it does not indicate the format standard that audio/wav must adhere to for interoperability between messaging systems. On desktop-oriented messaging systems, audio/wav (rather than audio/vnd.wave) is the defacto standard.

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#### **4. IANA Registration**

To: ietf-types@iana.org

Subject: Registration of MIME media type audio/wav

MIME media type name: audio

MIME subtype name: wav

Required parameters: none

Optional parameters: codec = [codec id]

Encoding considerations:

Binary or Base-64 generally preferred

Security considerations:

There are no known security risks with the sending or playing of audio data. Wav-encapsulated audio data is typically interpreted only by a codec supported by a wav audio player. Unintended information introduced into the data stream will result in noise.

Interoperability considerations:

Published specification:

None

Applications which use this media type:

Multimedia and voice messaging applications

Additional information:

Magic number(s): ?

File extension(s): .wav

Macintosh File Type Code(s): WAVE

Person & email address to contact for further information:

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Intended usage: COMMON

Author/Change controller:

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## **6. References**

- [G726] CCITT Recommendation G.726 (1990), General Aspects of Digital Transmission Systems, Terminal Equipment - 40, 32, 24,16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM).
- [MIME4] Freed, N., Klensin, J., and J. Postel, "Multipurpose Internet Mail Extensions (MIME) Part Four: Registration Procedures", [RFC 2048](#), November 1996.
- [VPIM1] Vaudreuil, G., "Voice Profile for Internet Mail", [RFC 1911](#), February 1996.
- [VPIM2] Vaudreuil, G., and G. Parsons, "Voice Profile for Internet Mail - version 2", [RFC 2421](#), September 1998.
- [VPIM3] Vaudreuil, Greg, "Voice Profile for Internet Mail, Version 2", Work In Progress, <[draft-ema-VPIMv3-00.txt](#)>, December 1998.
- [REQ] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [WAVE] Fleischman, E., "WAVE and AVI Codec Registries", [RFC 2361](#), June 1998.





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