# Audio Video Interleave

**Audio Video Interleave** (also **Audio Video Interleaved**), known by its initials **AVI** and the `.avi` filename extension is a multimedia container format introduced by Microsoft in November 1992 as part of its Video for Windows software. AVI files can contain both audio and video data in a file container that allows synchronous audio-with-video playback. Like the DVD video format, AVI files support multiple streaming audio and video, although these features are seldom used.

Many AVI files use the file format extensions developed by the Matrox OpenDML group in February 1996.[2] These files are supported by Microsoft, and are unofficially called "**AVI 2.0**".[3] In 2010 the US government's National Archives and Records Administration defined AVI as the official wrapper for preserving digital video.[4]

| Audio Video Interleave | |
|---|---|
| **Filename extension** | `.avi` |
| **Internet media type** | `video/vnd.avi`[1] `video/avi` `video/msvideo` `video/x-msvideo` |
| **Type code** | 'Vfw ' |
| **Uniform Type Identifier (UTI)** | public.avi |
| **Developed by** | Microsoft |
| **Initial release** | November 1992 |
| **Container for** | Audio, Video |
| **Extended from** | Resource Interchange File Format |

## Contents

# Format

AVI is a subformat of the Resource Interchange File Format (RIFF), which divides a file's data into blocks, or "chunks." Each "chunk" is identified by a FourCC tag. An AVI file takes the form of a single "chunk" in a RIFF formatted file, which is then subdivided into two mandatory "chunks" and one optional "chunk".

The first sub-chunk is identified by the "hdrl" tag. This sub-chunk is the file header and contains metadata about the video, such as its width, height and frame rate. The second sub-chunk is identified by the "movi" tag. This chunk contains the actual audio/visual data that make up the AVI video. The third optional sub-chunk is identified by the "idx1" tag which indexes the offsets of the data chunks within the file.

By way of the RIFF format, the audio-visual data contained in the "movi" chunk can be encoded or decoded by software called a codec, which is an abbreviation for (en)coder/decoder. Upon creation of the file, the codec translates between raw data and the (compressed) data format used inside the chunk. An AVI file may

carry audio/visual data inside the chunks in virtually any compression scheme, including Full Frame (Uncompressed), Intel Real Time (Indeo), Cinepak, Motion JPEG, Editable MPEG, VDOWave, ClearVideo / RealVideo, QPEG, and MPEG-4 Video.

Some programs, like VLC, complain when the "idx1" index sub-chunk is not found, as it is required for efficient moving among timestamps (seeking). They offer to "fix" the file by building an index temporarily or permanently.[5]

# Metadata

As a derivative of the Resource Interchange File Format (RIFF), AVI files are commonly tagged with metadata in the INFO chunk. In addition, AVI files can embed Extensible Metadata Platform (XMP). By design, any RIFF file can legally include additional chunks of data, each identified by a four-character code; software which does not understand that particular code should skip the chunk. As such, it is theoretically possible to expand any RIFF file format, including AVI, to support almost any conceivable metadata. Some of the limitations of AVI in modern use relate to a lack of standardization in this metadata (see Limitations below).

# Limitations

Since its introduction in the early 90s, new computer video techniques have been introduced which the original AVI specification did not anticipate.

- The original AVI specification does not provide a standardized way to encode aspect ratio information, although the later OpenDML (AVI 2.0) specification does. Consequently, older players may not select the right aspect ratio automatically (though it may be possible to do so manually).[6]
- There are several competing approaches to including a time code in AVI files, which affects usability of the format in film and television post-production, although it is widely used.[7] For WAV audio files, Broadcast Wave (BWF) extensions were designed to standardize post-production metadata, but an equivalent for AVI files has not emerged. Some parties are known to write BWF chunks into AVI for metadata.[8]
- AVI was not intended to contain video using any compression technique that requires access to future video frame data beyond the current frame (B-frame). Approaches exist to support modern video compression techniques (such as MPEG-4) that rely on this function, although this is beyond the intent of the original specification and may cause problems with playback software which does not anticipate this use.[9]
- AVI cannot contain some specific types of variable bitrate (VBR) data reliably (such as MP3 audio at sample rates below 32 kHz).
- Overhead for AVI files at the resolutions and frame rates normally used to encode standard definition feature films is about 5 MB per hour of video, the significance of which varies with the application.
- AVI files cannot contain attachments such as fonts and subtitles. Consequently, subtitles must be distributed in a separate file or hardcoded into the video stream.

More recent container formats (such as Matroska, Ogg and MP4) solve all these problems, although software is freely available to both create and correctly replay AVI files which use the techniques described here.

# DV AVI

DV AVI is a type of AVI file where the video has been compressed to conform with DV standards. There are two types of DV-AVI files:

- Type 1: The multiplexed Audio-Video is kept in its original multiplexing and saved together into the Video section of the AVI file

    - Does not waste much space (audio is saved uncompressed, but even uncompressed audio is tiny compared to the video part of DV), but Windows applications based on the VfW API do not support it.
- Type 2: Like type 1, but audio is also saved as an additional audio stream into the file.

    - Supported by VfW applications, at the price of a small increase in file size.

Type 1 is actually the newer of the two types. Microsoft made the "type" designations, and decided to name their older VfW-compatible version "Type 2", which only furthered confusion about the two types. In the late 1990s through early 2000s, most professional-level DV software, including non-linear editing programs, only supported Type 1. One notable exception was Adobe Premiere, which only supported Type 2. High-end FireWire controllers usually captured to Type 1 only, while "consumer" level controllers usually captured to Type 2 only. Software is and was available for converting Type 1 AVIs to Type 2, and vice versa, but this is a time-consuming process.

Many current FireWire controllers still only capture to one or the other type. However, almost all current DV software supports both Type 1 and Type 2 editing and rendering, including Adobe Premiere. Thus, many of today's users are unaware of the fact that there are two types of DV AVI files. In any event, the debate continues as to which – Type 1 or Type 2 – if either, is better.

## See also

- Comparison of container formats
- List of video editing software

## References

1. Microsoft Corporation (June 1998). "WAVE and AVI Codec Registries - RFC 2361" (http://tools.ietf.org/html/rfc2361). IETF. Retrieved 2009-12-06.
2. "AVI File Format with OpenDML Extensions, Version 1.02" (https://www.loc.gov/preservation/digital/formats/fdd/fdd000442.shtml). www.loc.gov. 2016-03-09. Retrieved 2019-09-01.
3. stevewhims. "AVI RIFF File Reference - Windows applications" (https://docs.microsoft.com/en-us/windows/win32/directshow/avi-riff-file-reference). docs.microsoft.com. Retrieved 2019-09-01.
4. "Video Digital Product Options" (https://www.archives.gov/preservation/products/definitions/video-opt.html). www.archives.gov. Retrieved 2019-09-01.
5. "WindowsFAQ-1.1.x" (https://wiki.videolan.org/WindowsFAQ-1.1.x#Can_I_fix_those_broken_AVI_files_permanently.3F). VideoLAN Wiki.
6. "Determining the Shape of Pixels and Frames" (http://www.microsoft.com/windows/windowsmedia/howto/articles/PixelFrames.aspx).
7. Rhodes, Phil (NaN). "[FFmpeg-user] AVI and Timecode" (https://lists.ffmpeg.org/pipermail/ffmpeg-user/2014-December/024588.html). Check date values in: |date= (help)
8. "AVI MetaEdit - Technical Metadata" (https://mediaarea.net/AVIMetaEdit/tech_view_help). mediaarea.net.

9. "Using B-frames" (https://www.avidemux.org/admWiki/doku.php?id=using:b-frames).
   *Avidemux*.

# External links

- John P. McGowan's AVI Overview (http://www.jmcgowan.com/avi.html)
- Microsoft's AVI RIFF File Reference (http://msdn2.microsoft.com/en-us/library/ms779636.aspx)
- PVDTools' RIFF-AVI File Format Documentation (https://web.archive.org/web/2007092017464 8/http://pvdtools.sourceforge.net/aviformat.txt)
- Dave Wilson's comprehensive list of FourCC codes (http://www.fourcc.org)
- OpenDML (AVI 2.0) format specification (https://web.archive.org/web/20070112225112/http://w ww.the-labs.com/Video/odmlff2-avidef.pdf)
- AVI file format documentation (https://web.archive.org/web/20170411001412/http://www.alexan der-noe.com/video/documentation/avi.pdf) (pdf)
- Type 1 and 2 DV AVI files (http://msdn.microsoft.com/en-us/library/windows/desktop/dd40725 0%28v=vs.85%29.aspx)
- AVI file Structure (https://web.archive.org/web/20171211083723/http://www.ezr8.com/avi.html)