GUIDE TO AUDIO FORMAT FORMATS

To the uninitiated, they look like an alphabet soup. Audio file formats—digital ways to listen to music and sound, in other words, not on a disk or cassette of some sort—are numerous and can be complicated and confusing. Below, we'll try to sort it out for you.

But, first… As if recording actual sound onto playback-able vinyl or ribbons of acetate is not miraculous enough, just how does one put it in digital form?

It mainly involves something called "compression." Audio compression is the act of copying and reducing some aspects/details of an audio recording so that it is a smaller file and, therefore, easier to share from user to user.

Often, however, as this compression is done, some of the original sound quality is lost.

As a metaphor for this, imagine that a sound recording of yours is, instead, as a book. In this scenario, before that book arrives to you, that book is "compressed"—some of its contents have been jettisoned (maybe the title page, the table of contents, the index, the bibliography and one or two "unimportant" chapters). But, what you get, is still the major gist of the book and it sure is a lot lighter to carry around. Similarly, a "compressed" audio file will take up less space on your bookshelf (i.e. on your hard drive) and be easier to share with someone else and take less time to read (i.e. download).

To gauge a digital sound file's "completeness," sound aficionados use the words "lossy" or "lossless."

As you can probably figure out, "lossy" means that some audio quality is lost as the sound is transformed for its original into this new type of digital file (for example, an MP3) or "lossless," which, obviously, means nothing has been lost in terms of sound quality (for example, FLAC recordings).

There's a plethora of digital sound file formats. Let's break it down….

MP3

Though probably not the first digital audio file format, the MP3, birthed c.1991, is easily the most commonly used, certainly within the commercial sphere.

But the reason that MP3's are so popular is pretty much due to their ease of use and high-speed downloading and due to their ease for easy file sharing. But that speed and ease arrives only through its heavy compression which results in a very "lossy" resolution or final result.

In short, with MP3's, you are simply not getting the best sound quality. You will probably notice the most loss in terms of bass, resulting in a more "shallow" sound.

While, to many listeners, MP3's are fine for their personal entertainment needs (and they remain the primary currency that various online purchasing site still use), they are not favored by audio professionals.

MP3's suffix is .mp3.

MP4
Though, yes, MP4 files can be used to store audio, MP4 is pretty much used only for video images. Its suffix for files is .mp4.

WAV
WAV file is short for "Waveform Audio File Format" and was a joint invention of Microsoft and IBM in 1991. Its files have a suffix of .wav.

WAV files, today, are now very much in use. WAV files have the distinction of being uncompressed and therefore there is no audio loss (i.e. it is "lossless"). But while the sound quality is much better with a WAV file than an MP3, you "pay" for that sound quality in the sound of the file size of a WAV file. Because WAV files are so much larger, they are not ideally suited for either streaming or casual use.

However, because of WAV's high resolution, it is the most commonly used file type embedded on CD's.

One big drawback of WAV however is that its signal contains no timestamp. Therefore, when engineers work with WAV files, and might be looking for a specific part of a recording, it is not an expedient process.

It should also be noted that there is another type of WAV file known as Broadcast Wave File (BWF) (born 1997). As its name implies, it was designed specifically for broadcast use and editing. It is equipped with great metadata and supports timecode making it easier to synchronize with other recordings.

AAC
Also known as Advanced Audio Coding, AAC was developed by the folks at Apple. It was released by that company in 1997. It's considered a "lossy" format because it uses compression BUT its compression rate is better than that of the MP3, giving it a better sound quality. It is

useful for the streaming of audio but is not as widely used/supported as the more popular MP3 format is. AAC files have several suffixes, including: .3gp, .aac, and .adif, among others.

OPUS
Opus emerged in 2012. It's suffix is .opus. Though it can record music, it was mainly designed for recording and coding speech. It is "open source"—meaning you can acquire it and use it for free. It utilizes compression and therefore is considered "lossy."

FLAC
FLAC stands for "Free Lossless Audio Codec." It is a "lossless" format and involves no compression. It is also an open format and was developed by Xiph.Org Foundation in 2001. It has a larger file size which might not make it friendly to the casual or home user but libraries and sound archives often use it as an archiving format. Its suffix is .flac.

AIFF
This is the abbreviation for Audio Interchange File Format. It began around 1988 and was developed by Apple. It, too, is an uncompressed method of storing and sharing audio. Since there is no compression, loss is avoided. But AIFF has a large file sizes and works the best with other Apple products. It is often used in professional applications and has a suffix of .aif or .aifc.

ALAC
AIFF is not to be confused with ALAC (Apple Lossless Audio Codec) though they are quite similar. Both were developed by Apple. ALAC debuted around 2004 and has a suffix of .alac. It is also a lossless format—so the sound quality is good--but, like AIFF, while it is compatible with various systems, it works best with other Apple machines.

OGG
OGG came out in 2004. It was developed by the Xiph.Org Foundation. Its most common suffix is .ogg. It can be used for both audio and video and also for text and metadata. It is an "open format," which means it is free to use. OGG was mainly created to be utilized in streaming. It is a lossless format. It can be transferred easily to MP3.

DSD
DSD stand for Direct Stream Digital and was released to the public in 1999. It was developed by Sony and Philips. It was originally developed for preservation and introduced to consumers on SACD (Super Audio Compact Disc). Its suffix is DSD. DSD used delta-sigma modulation: "a technique where audio is represented by a sequence of single-bit values (0 or 1) at a very high sampling rate. The oversampled signal is shaped to reduce noise and distortion, enabling high resolution audio." DSD sampling rates are 2.8 MHz, 5.6 MHz and 11.2 MHz. It is a downloadable format that can be played back by consumer using software players.

For additional information:
https://www.loc.gov/preservation/resources/rfs/audio.html

https://www.digitizationguidelines.gov/