What is Codec ?

a device or program that compresses data to enable faster transmission and decompresses received data.

Why we need Codec ?

1. Reduce the amount of data storage space required.

2. Reduce length of data transmission time over the network.

3.reduce the consumption of expensive resources, such as hard disk space or transmission bandwidth.

What are Audio Codec ?

An **audio codec** is a device or [computer program](https://en.wikipedia.org/wiki/Computer_program) capable of [coding](https://en.wikipedia.org/wiki/Encoder) or [decoding](https://en.wikipedia.org/wiki/Decoding_methods) a [digital](https://en.wikipedia.org/wiki/Digital_data) [data stream](https://en.wikipedia.org/wiki/Data_stream) of audio.

In software, an audio codec is a computer program implementing an [algorithm](https://en.wikipedia.org/wiki/Algorithm) that [compresses and decompresses](https://en.wikipedia.org/wiki/Audio_compression_(data)) digital audio data according to a given [audio file](https://en.wikipedia.org/wiki/Audio_file) or [streaming media](https://en.wikipedia.org/wiki/Streaming_media) [audio coding format](https://en.wikipedia.org/wiki/Audio_coding_format).

Different audio files ?

### MP3 (.mp3)

[MP3](http://www.webopedia.com/TERM/M/MP3.html) is the name of the file extension and also the name of the type of file for [MPEG](http://www.webopedia.com/TERM/M/MPEG.html), audio layer 3. Layer 3 is one of three coding schemes (layer 1, layer 2 and layer 3) for the compression of audio signals. Layer 3 uses perceptual audio coding and psychoacoustic compression to remove all superfluous information (more specifically, the redundant and irrelevant parts of a sound signal. The stuff the human ear doesn't hear anyway). It also adds a MDCT (Modified Discrete Cosine Transform) that implements a filter bank, increasing the frequency resolution 18 times higher than that of layer 2. The result in real terms is layer 3 shrinks the original sound data from a CD (with a bit rate of 1411.2 kilobits per one second of stereo music) by a factor of 12 (down to 112-128kbps) without sacrificing sound quality.

### WMA - Windows Media Audio (.wma)

Short for Windows Media Audio, [WMA](http://www.webopedia.com/TERM/W/WMA.html) is a Microsoft file format for encoding digital audio files similar to MP3 though can compress files at a higher rate than MP3. WMA files, which use the ".wma" file extension, can be of any size compressed to match many different connection speeds, or bandwidths.

### WAV (.wav)

[WAV](http://www.webopedia.com/TERM/W/WAV.html) is the format used for storing sound in files developed jointly by Microsoft and IBM. Support for WAV files was built into Windows 95 making it the de facto standard for sound on PCs. WAV sound files end with a .wav extension and can be played by nearly all Windows applications that support sound.

### Real Audio (.ra  .ram .rm)

Real Audio is a proprietary format, and is used for streaming audio that enables you to play digital audio files in real-time. To use this type of file you must have RealPlayer (for Windows or Mac), which you can download for free. Real Audio was developed by RealNetworks.

### MIDI - Musical Instrument Digital Interface (.mid)

Short for musical instrument digital interface, [MIDI](http://www.webopedia.com/TERM/M/MIDI.html) is a standard adopted by the electronic music industry for controlling devices, such as synthesizers and sound cards, that emit music. At minimum, a MIDI representation of a sound includes values for the note's pitch, length, and volume. It can also include additional characteristics, such as attack and delay time.

### Ogg (.ogg)

[Ogg](http://www.webopedia.com/TERM/O/Ogg_Vorbis.html) is an audio compression format, comparable to otheromxplayer -o both example.mp3 formats used to store and play digital music, but differs in that it is free, open and unpatented. It uses Vorbis, a specific audio compression scheme that's designed to be contained in Ogg.

List of Audio Codecs ?

**Non compression :** Data is not Compressed.

Ex: such as [WAV](https://en.wikipedia.org/wiki/WAV), [AIFF](https://en.wikipedia.org/wiki/AIFF), [AU](https://en.wikipedia.org/wiki/Au_file_format) or [raw](https://en.wikipedia.org/wiki/Raw_audio_format) header-less [PCM](https://en.wikipedia.org/wiki/Pulse-code_modulation);

**Lossless Audio Compression :** Data is not Discarded while compression.

Ex:such as [FLAC](https://en.wikipedia.org/wiki/Free_Lossless_Audio_Codec), [Monkey's Audio](https://en.wikipedia.org/wiki/Monkey's_Audio) ([filename extension](https://en.wikipedia.org/wiki/Filename_extension) .ape), [WavPack](https://en.wikipedia.org/wiki/WavPack) ([filename extension](https://en.wikipedia.org/wiki/Filename_extension) .wv), [TTA](https://en.wikipedia.org/wiki/TTA_(codec)), [ATRAC](https://en.wikipedia.org/wiki/ATRAC) Advanced Lossless, [ALAC](https://en.wikipedia.org/wiki/Apple_Lossless) ([filename extension](https://en.wikipedia.org/wiki/Filename_extension) .m4a), [MPEG-4 SLS](https://en.wikipedia.org/wiki/MPEG-4_SLS), [MPEG-4 ALS](https://en.wikipedia.org/wiki/MPEG-4_ALS), [MPEG-4 DST](https://en.wikipedia.org/wiki/MPEG-4_DST), [Windows Media Audio Lossless (WMA Lossless)](https://en.wikipedia.org/wiki/Windows_Media_Audio" \l "Windows_Media_Audio_Lossless), and [Shorten](https://en.wikipedia.org/wiki/Shorten_(file_format)) (SHN).

**Lossy Audio compression :** Data is Discarded while compressing.

Ex:such as [Opus](https://en.wikipedia.org/wiki/Opus_(audio_format)), [MP3](https://en.wikipedia.org/wiki/MP3), [Vorbis](https://en.wikipedia.org/wiki/Vorbis), [Musepack](https://en.wikipedia.org/wiki/Musepack), [AAC](https://en.wikipedia.org/wiki/Advanced_Audio_Coding), [ATRAC](https://en.wikipedia.org/wiki/ATRAC) and [Windows Media Audio Lossy (WMA lossy)](https://en.wikipedia.org/wiki/Windows_Media_Audio" \l "WIndows_Media_Audio_Lossy).

reduce the consumption of expensive resources, such as hard disk space or transmission bandwidth.

Different video files ?

The following is a brief explanation of the different video file formats found commonly online:

Most videos files have at least two types of file formats. First there is the container, and then the [codec](http://www.libtiff.org/codec.html) which is used inside the container.

The container is what describes the whole structure of the file, and specifies which codec’s are being used. The following is a list of some of the more common types of container formats:

Flash Video Format (.flv)  
Because of the cross-platform availability of Flash video players, the Flash video format has become increasingly popular. Flash video is playable within Flash movies files, which are supported by practically every browser on every platform. Flash video is compact, using compression from On2, and supports both progressive and streaming downloads.

AVI Format (.avi)  
The AVI format, which stands for audio video interleave, was developed by Microsoft.   
It stores data that can be encoded in a number of different codec’s and can contain both audio and video data. The AVI format usually uses less compression than some similar formats and is a very popular format amongst internet users.

AVI files most commonly contain M-JPEG, or DivX codec’s, but can also contain almost any format.

The AVI format is supported by almost all computers using Windows, and can be played on various players.  
Some of the most common players that support the avi format are:

* Apple QuickTime Player (windows & Mac)
* Microsoft Windows Media Player (Windows & Mac)
* VideoLAN VLC media player (Windows & Mac)
* Nullsoft Winamp

Quicktime Format (.mov)  
The QuickTime format was developed by Apple and is a very common one. It is often used on the internet, and for saving movie and video files.

The format contains one or more tracks storing video, audio, text or effects. . It is compatible with both Mac and Windows platforms, and can be played on an Apple Quicktime player.

MP4 Format (.mp4)  
This format is mostly used to store audio and visual streams online, most commonly those defined by MPEG. It Expands MPEG-1 to support video/audio "objects", 3D content, low bit rate encoding and support for Digital Rights Management.

The MPEG-4 video format uses separate compression for audio and video tracks; video is compressed with MPEG-4 video encoding; audio is compressed using AAC compression, the same type of audio compression used in .AAC files.

The mp4 can most commonly be played on the Apple QuickTime Player or other movie players. Devices that play p4 are also known as mp4 players.

Mpg Format (.mpg)  
Common video format standardized by the Moving Picture Experts Group (MPEG); typically incorporates MPEG-1 or MPEG-2 audio and video compression; often used for creating downloadable movies. It can be played using Apple QuickTime Player or   
Microsoft Windows Media Player.

Windows Media Video Format (.wmv)  
WMV format, short for Windows Media Video was developed by Microsoft. It was originally designed for internet streaming applications, and can now cater to more specialized content. Windows Media is a common format on the Internet, but Windows Media movies cannot be played on non-Windows computer without an extra (free) component installed. Some later Windows Media movies cannot play at all on non-Windows computers because no player is available.  
Videos stored in the Windows Media format have the extension .wmv.  
  
3GP File Extension (.3gp)  
The 3gp format is both an audio and video format that was designed as a multimedia format for transmitting audio and video files between 3G cell phones and the internet. It is most commonly used to capture video from your cell phone and place it online.   
This format supports both Mac and windows applications and can be commonly played in the following:

* Apple QuickTime Player
* RealNetworks RealPlayer
* VideoLAN VLC media player
* MPlayer
* MIKSOFT Mobile 3GP Converter (Windows)

Advances Streaming Format (.asf)  
ASF is a subset of the wmv format and was developed by Microsoft. It is intended for streaming and is used to support playback from digital media and HTTP servers, and to support storage devices such as hard disks. It can be compressed using a variety of video codecs.

The most common files types that are contained within an ASF file are Windows Media Audio, and Windows Media video.

Real Media Format (.rm)  
RealMedia is a format which was created my RealNetworks. It contains both audio and video data and typically used for streaming media files over the internet.   
Realmedia can play on a wide variety of media players for both Mac and Windows platforms. The realplayer is the most compatible.

Flash Movie Format (.swf )  
The Flash movie format was developed my Macromedia.

This format can include text, graphics and animation. In order to play in Web Browsers, they must have the Flash Plug-In Installed. The flash plug in comes preinstalled in the latest version of many popular Web Browsers.

The RealVideo Format  
The RealVideo format was developed for the Internet by Real Media. The format is used for streaming of video at low bandwidths. This sometimes causes the quality of the videos to be reduced.

https://forum.kodi.tv/showthread.php?tid=148704

List of Video Codecs :

**Lossless Video Compression**

**Lossy Video Compression**

**Audio and Video Codecs supported by Andriod platform.**

### **Audio formats and codecs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Format / Codec | Encoder | Decoder | Details | Supported File Type(s) / Container Formats |
| AAC LC | • | • | Support for mono/stereo/5.0/5.1 content with standard sampling rates from 8 to 48 kHz. | • 3GPP (.3gp) • MPEG-4 (.mp4, .m4a) • ADTS raw AAC (.aac, decode in Android 3.1+, encode in Android 4.0+, ADIF not supported) • MPEG-TS (.ts, not seekable, Android 3.0+) |
| HE-AACv1 (AAC+) | • (Android 4.1+) | • |
| HE-AACv2 (enhanced AAC+) |  | • | Support for stereo/5.0/5.1 content with standard sampling rates from 8 to 48 kHz. |
| AAC ELD (enhanced low delay AAC) | • (Android 4.1+) | • (Android 4.1+) | Support for mono/stereo content with standard sampling rates from 16 to 48 kHz |
| AMR-NB | • | • | 4.75 to 12.2 kbps sampled @ 8kHz | 3GPP (.3gp) |
| AMR-WB | • | • | 9 rates from 6.60 kbit/s to 23.85 kbit/s sampled @ 16kHz | 3GPP (.3gp) |
| FLAC |  | • (Android 3.1+) | Mono/Stereo (no multichannel). SamplSome Android Wear devices include speakers, enabling them to incorporate sound into their apps and offer an extra dimension of engagement with the user. A speaker-equipped Wear device might trigger a clock or timer alarm, complete with audio notification. Games on Wear become become more entertaining by offering not just sight, but sound.e rates up to 48 kHz (but up to 44.1 kHz is recommended on devices with 44.1 kHz output, as the 48 to 44.1 kHz downsampler does not include a low-pass filter). 16-bit recommended; no dither applied for 24-bit. | FLAC (.flac) only |
| MIDI |  | • | MIDI Type 0 and 1. DLS Version 1 and 2. XMF and Mobile XMF. Support for ringtone formats RTTTL/RTX, OTA, and iMelody Some Android Wear devices include speakers, enabling them to incorporate sound into their apps and offer an extra dimension of engagement with the user. A speaker-equipped Wear device might trigger a clock or timer alarm, complete with audio notification. Games on Wear become become more entertaining by offering not just sight, but sound. | • Type 0 and 1 (.mid, .xmf, .mxmf) • RTTTL/RTX (.rtttl, .rtx) • OTA (.ota) • iMelody (.imy) |
| MP3 |  | • | Mono/Stereo 8-320Kbps constant (CBR) or variable bit-rate (VBR) | MP3 (.mp3) |
| Opus |  | • (Android 5.0+) |  | Matroska (.mkv) |
| PCM/WAVE | • (Android 4.1+) | • | 8- and 16-bit linear PCM (rates up to limit of hardware). Sampling rates for raw PCM recordings at 8000, 16000 and 44100 Hz. | WAVE (.wav) |
| Vorbis |  | https://forum.kodi.tv/showthread.php?tid=148704• |  | • Ogg (.ogg) • Matroska (.mkv, Android 4.0+) |

## Video support

### Video formats and codecs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Format / Codec | Encoder | Decoder | Details | Supported File Type(s) / Container Formats |
| H.263 | • | • | Support for H.263 is optional in Android 7.0+ | • 3GPP (.3gp) • MPEG-4 (.mp4) |
| H.264 AVC Baseline Profile (BP) | • (Android 3.0+) | • | Some Android Wear devices include speakers, enabling them to incorporate sound into their apps and offer an extra dimension of engagement with the user. A speaker-equipped Wear device might trigger a clock or timer alarm, complete with audio notification. Games on Wear become become more entertaining by offering not just sight, but sound. | • 3GPP (.3gp) • MPEG-4 (.mp4) • MPEG-TS (.ts, AAC audio only, not seekable, Android 3.0+) |
| H.264 AVC Main Profile (MP) | • (Android 6.0+) | • | The decoder is required, the encoder is recommended. |  |
| H.265 HEVC |  | • (Android 5.0+) | Main Profile Level 3 for mobile devices and Main Profile Level 4.1 for Android TV | • MPEG-4 (.mp4) |
| MPEG-4 SP |  | • |  | 3GPP (.3gp) |
| VP8 | • (Android 4.3+) | • (Android 2.3.3+) | Streamable only in Android 4.0 and above | • [WebM](http://www.webmproject.org/) (.webm) • Matroska (.mkv, Android 4.0+) |
| VP9 |  | • (Android 4.4+) |  | • [WebM](http://www.webmproject.org/) (.webm) • Matroska (.mkv, Android 4.0+) |

**Audio Headset port available :**

=> 3.5 mm jack

**Audio driver supported :**

=> HDMI for both audio and vedio can be used.

**Vedio codecs Supported by Rassberry pi 3 with Nogout**

=> h.264 codec

**To play an MP3 file, navigate to the location of the .mp3 file in the terminal using cd and then type the following command**:

omxplayer example.mp3

This will play the audio file example.mp3 through either your monitor's built-in speakers or your headphones, connected via the headphone jack.

If you need an example file you can download one from here using the following command:

wget https://goo.gl/XJuOUW -O example.mp3 --no-check-certificate

If you cannot hear anything, make sure your headphones or speakers are connected correctly. Note that omxplayer doesn't use ALSA and so ignores the [audio configuration](https://www.raspberrypi.org/documentation/configuration/audio-config.md) set by raspi-config or amixer.

If omxplayer's auto-detection of the correct audio output device fails, you can force output over HDMI with:

omxplayer -o hdmi example.mp3

Alternatively, you can force output over the headphone jack with:

omxplayer -o local example.mp3

You can even force output over both the headphone jack and HDMI with:

omxplayer -o both example.mp3