What is Video Transcoding?

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What is video transcoding?

Video transcoding is the process of converting video files from one format to another by adjusting parameters such as resolution, encoding, and bitrate. Video is increasingly important to organizations of all sizes as a method of connecting and communicating with end users. However, setting up optimum video workflows is challenging because of the diverse requirements for bandwidth and end-user devices. With video transcoding, you can create video files in multiple resolutions and bitrate options from the original video file. You can also optimize video quality, so end users have more options and more control over their viewing experience.

What are the benefits of video transcoding?

Video transcoding is vital for businesses because it provides the following benefits.

Reach a wider audience

With video transcoding, you can adapt videos and audio files to new media formats. For example, you can transcode a segment of a YouTube video to reuse it on a different social media site. Alternative formats are compatible with various platforms, operating systems, and devices. With this flexibility, you can reach a broader audience without a user's device or operating system preventing them from viewing your video.

Optimize video quality

Optimizing your video creates a smooth playback experience with the high image quality that users prefer. You can optimize the quality of your videos by changing video parameters such as codec settings, resolution, and bitrate. By changing these parameters, you can create the optimal video settings for different devices. You can also lower the total amount of data that you transmit over the network. When you increase transmission efficiency, you minimize buffering and improve a user's video streaming experience.

Cost savings

You can also use video transcoding to adapt to varying network conditions. Video compression decreases the file size of the video to manage different bandwidth capacities, which reduces transfer costs. Optimization of a video's file format also reduces the costs of transferring or storing it. This strategy is useful for streaming services and other video-hosting platforms.

What are the use cases of video transcoding?

Companies in the media and entertainment industry—including film and TV studios, programming distributors, internet service providers, professional sports leagues and teams, and online content creators—use video transcoding for various use cases. The following are some examples.

Video editing

When studios create videos for distribution, they use video transcoding throughout the editing process. First, editors transcode original files from a camera into a format that works with their editing software. Next, they edit the clips and transcode the final edited version

into the desired delivery format. Transcoding also makes the editing process much easier because it can reduce the size of video files for a smooth editing experience.

Content distribution

Transcoding supports the distribution of video files to a range of platforms. Distributors transcode the master file into the specific distribution formats that they use, depending on the final streamlining location of the video. For example, different parts of the world use distinct video format standards. The United Kingdom uses the Phrase Altering Line (PAL), the United States uses the National Television System Committee (NTSC), and Saudi Arabia uses Sequential Color and Memory (SECAM).

Similarly, all streaming services, such as YouTube and Amazon Prime Video, have varying technical requirements for delivering video content to their audiences. Editors can transcode a version of the video that matches these specifications. A standard web-friendly video format is the *H.264 codec*.

Television broadcasting

Cable TV providers use transcoding to compress media files and transmit them to channel subscribers. This strategy minimizes bandwidth usage while maintaining a high level of quality.

Broadcasting networks transcode videos to deliver different file formats to terrestrial TV networks, satellite TV, and cable TV. Platforms and regions can have different broadcasting standards, and video transcoding ensures compatibility and compliance with these specifications.

Live streaming events

Live events like sports matches, webinars, concerts, and gaming rely on transcoding software to adapt the file format to different end devices. By adjusting the video file to a user's

device, you can provide a high-quality viewing experience. When you package videos with web-friendly adaptive streaming formats, such as HTTP live streaming (HLS), you enable playback on practically any device.

Pay-per-view subscription services

Pay-per-view channels or subscription services use transcoding to deliver media to users who pay. Providers use digital rights management (DRM) to encrypt video content and protect against unauthorized viewers. When a user plays a video, the platform requests a license key from the server. The server determines if the user is authorized before it sends a decryption key and allows playback. These streaming services also use video transcoding to ensure that users receive a high-quality viewing experience, no matter which device they view from.

Online video meeting platforms

Online meeting platforms such as [Amazon Chime](#) transcode video from meeting attendees to display a high-quality video stream. These platforms use adaptive streaming to alter playback quality and format based on internet connection speeds and device type.

How does video transcoding work?

Video transcoding is an umbrella term that refers to the decoding, processing, and encoding of media files. Transcoding video content begins with software analysis of the original files to determine the audio and video codecs, bitrate, frame rate, and resolution. Then the software compares this information to the required specification of a playback platform. If the extracted information isn't optimal for the platform, it transcodes the video and audio files by using the following steps.

De-multiplexing the video files

De-multiplexing (or *demuxing*) analyzes a video file to determine each individual signal—such as video, audio, and subtitles—from inside the video file. The process separates each of these signals into separate components. Then it can optimize each component individually, depending on the desired output format. For example, the audio component might require a compression format, and the video component might require re-encoding at a different bitrate. The separation of the video file into its components facilitates these specific adaptations.

Video decoding and post-processing

The compressed video component, isolated in the first step, is decoded into an uncompressed format. Standard, intermediate formats such as RGB and YUV help maintain the quality of the video. You can use either software or hardware decoding. Software

decoding is more flexible, and hardware decoding is faster.

Next, inverse quantization is used to recover the original pixel values for each video frame. Inverse quantization reconstructs the simplified video data by multiplying the quantized coefficient by the same step size and rounding the result. Alongside deblocking and compensation, this reconstructs the video and smooths it out.

Then the video data goes through postprocessing optimization, involving changes such as scaling, frame-rate conversion, and color correction.

Video encoding

After the software processes the uncompressed video, it's encoded into a new video codec or

format. This step compresses the video into the video codec type that is compatible with the target format or platform. The correct encoding settings enable the transcoding software to optimize the output video for that specific platform.

Multiplexing

Finally, the transcoding software uses multiplexing (or *muxing*) to combine all separated components into one multimedia file. The re-encoded video, subtitles, and audio streams merge into a single file. The software can also add metadata to the output file at this stage.

Standard codec formats and video containers

A video codec (short for *coder-decoder*) is the component that compresses and decompresses video and audio data. H.264 is one of the most prominent video codecs. It comes from a family of MPEG (the Motion Picture Experts Group). Other common codecs include VP9, Theora, and AV1.

A video container is a multimedia file that can hold various data streams in one file. The standard video containers are QuickTime File Format, MP4, FLV, WebM, Ogg, and Advanced Systems Format (ASF).

What are the types of video transcoding?

The video transcoding process can change depending on your criteria for the final media file. Here are the distinctions between the main types of transcoding.

Interframe vs. intraframe transcoding

Interframe transcoding changes the video compression settings between different frames in a video. It can adjust the specific bitrate, quality, and compression ratio across each frame. Interframe transcoding offers increased video smoothness.

Intraframe transcoding adjusts the compression settings within individual frames, without changing these settings across the frames. This approach provides a consistent level of quality within each frame of a video.

Lossless vs. lossy transcoding

Lossless transcoding doesn't result in data quality loss and retains the original video quality. This higher quality result results in larger file sizes.

Lossy transcoding compresses the video, which results in the reduction of quality. The loss of data also reduces the file size of the video. For video streaming, lossy transcoding can balance quality and file size for a smooth viewing experience.

Audio vs. video transcoding

Audio transcoding involves the conversion of audio files from one codec or format to another. For example, you can convert audio from MP3 to WAV or the other way around to change the file size, quality, or compatibility.

Video transcoding is converting video files from one codec or format to another. It includes changing video resolution, codec, and bitrate to adapt the media to different platforms.

Local transcoding vs. cloud transcoding

Local transcoding happens on local or on-premises software or hardware. You have to configure and maintain the IT infrastructure required for the transcoding process, which can be expensive and challenging at scale.

Cloud transcoding is performed over cloud infrastructure. It's scalable, accessible, and cost-effective because you don't have to maintain your own local hardware and software.

What are the differences between video transcoding and other related processes?

Several other processes closely relate to video transcoding, but they aren't the same. The following explores some of these differences.

Transcoding vs. encoding

Video encoding compresses video data to reduce its file size without impacting quality. It's one step in the video transcoding process but can also be performed independently of the larger transcoding pipeline. Encoding relates to data compression, and transcoding alters the video's format, codec, bitrate, resolution, or other main attributes.

Transizing vs. transrating

Both transizing and transrating are different steps in the transcoding process.

Transizing is altering the aspect ratio or resolution of a video without changing its format or codec. You commonly use transizing when you're making a video compatible with certain aspect ratios. For example, you can use transizing to prepare a video for a widescreen movie theatre or a social media post.

Transrating changes a video's bitrate to adjust it to different devices. A video bitrate is the number of bits that are transmitted in a specific period of time. Different bitrates control how much data flows in a period without changing the codec or resolution. You commonly use transrating with adaptive bitrate streaming, which offers a selection of video versions to
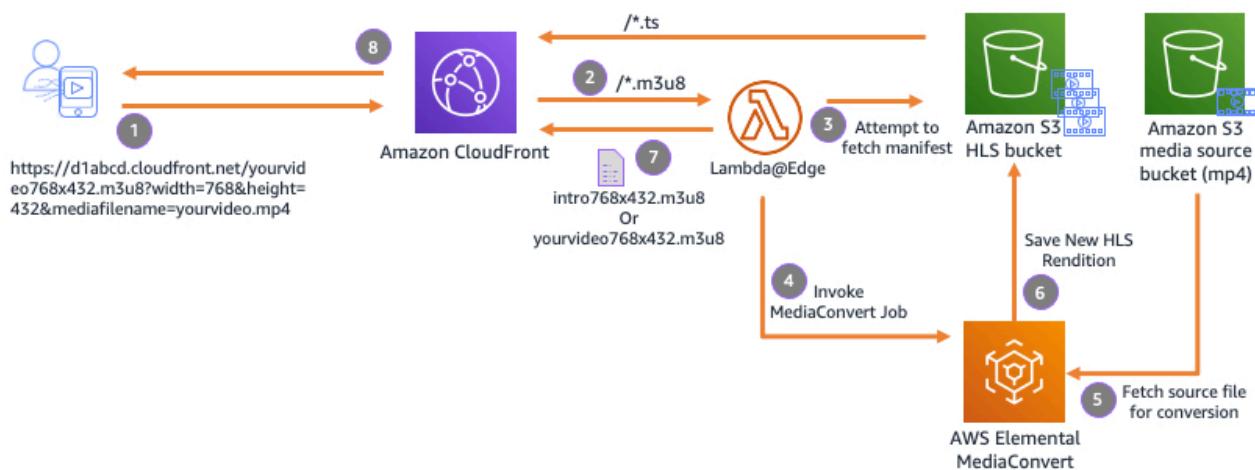
accommodate different internet bandwidths.

How can AWS support your video transcoding requirements?

Amazon Web Services (AWS) offers AWS Elemental MediaConvert, a file-based video transcoding service. With its broadcast-grade features, you can create live streaming content for broadcast and multi-screen delivery at scale. With MediaConvert, you can:

- Produce quality video outputs with broadcast-grade audio and video features

- Get the video processing settings that you need without having to manage transcoding infrastructure

- Scale your video processing services on demand to meet your workload

You can use MediaConvert to quickly and reliably convert content libraries for video streamlining and broadcasting. The following diagram shows how MediaConvert fits into a video transcoding workflow.

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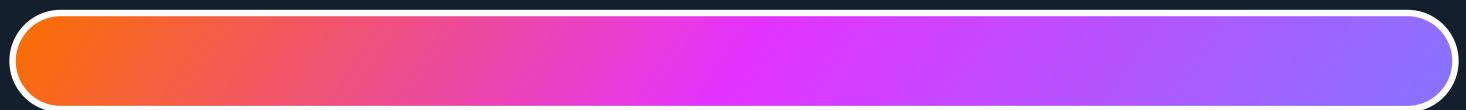
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