

Solution Brief

Open Source Multimedia Tools
Visual Computing Technology



FFmpeg Delivers Cross-Platform Video Recording, Conversion, Streaming, and More

Meeting the challenge of continuous on-demand entertainment requires a powerful multimedia framework. FFmpeg offers a solution built with open-source goodness and optimized by Intel.

“It [FFmpeg] supports the most obscure ancient formats up to the cutting edge, no matter if they were designed by some standards committee, the community, or a corporation.”¹
– FFmpeg developer team

Video creators contend with a persistent and difficult challenge when processing, storing, and distributing digital video content. Uncompressed video occupies huge amounts of storage and is difficult to distribute. For example, a full-size uncompressed video capture of a 4K UHD frame (3840 x 2160) consists of 8,294,400 pixels. At 24 frames per second, it requires a data rate of roughly 1,991 megabytes per second. Online streaming and production workflows are impractical without compression. But compression introduces challenges to maintain video quality during encoding and decoding. The quest to continually improve the efficiency and quality of video codecs and processing tools has been a primary technology focus for years.

FFmpeg, a widely adopted multimedia framework, features tools, libraries, and applications that handle multimedia data. It was developed as an open-source project. Available for free, FFmpeg includes versatile tools for decoding, encoding, transcoding, multiplexing, demultiplexing, denoising, streaming, filtering, and playing video. Because of this versatility and its built-in capabilities, FFmpeg has earned a role as a component of many different mainstream applications.

Dubbed the Open Source Multimedia System by its project co-founder, Fabrice Bellard, FFmpeg was first introduced in 2000. FFmpeg v5.0 (Lorentz) was released on January 17, 2022. Intel has been a significant contributor to the evolution and enhancement of FFmpeg during its long history.

Intel Optimizations Enhance FFmpeg

In recent years Intel has contributed optimizations for FFmpeg to improve efficiency and performance on Intel processor-based hardware. Patches produced by Intel add support for FFmpeg to Intel Iris® X^e Max AV1 hardware encoding, Intel Arc™ GPU products, and 12th Gen Intel Core™ processors.

For example, the oneVPL toolkit, successor to Intel Media SDK, makes it possible to enable FFmpeg for the latest generation of discrete and embedded GPUs. The oneVPL toolkit offers a way to enhance performance and improve power usage. New features and functionality for developers working with multimedia content are now delivered with [oneVPL](#).

Patch support also includes DirectX 11 technology, which enables low-power usage and VDEnc enabling. New features and functionality for developers are now delivered through oneVPL, enabling multi-GPU configurations, including integrated and discrete graphics.

With oneVPL, application developers can include [Intel Deep Link technology](#) to take advantage of those systems with multiple GPUs. The technology streamlines encoding, decoding, and transcoding operations. Recently released products, such as the Intel Arc Alchemist GPU, can offload video processing from the CPU to the GPU, as well as accomplish additional processing work on the CPU.



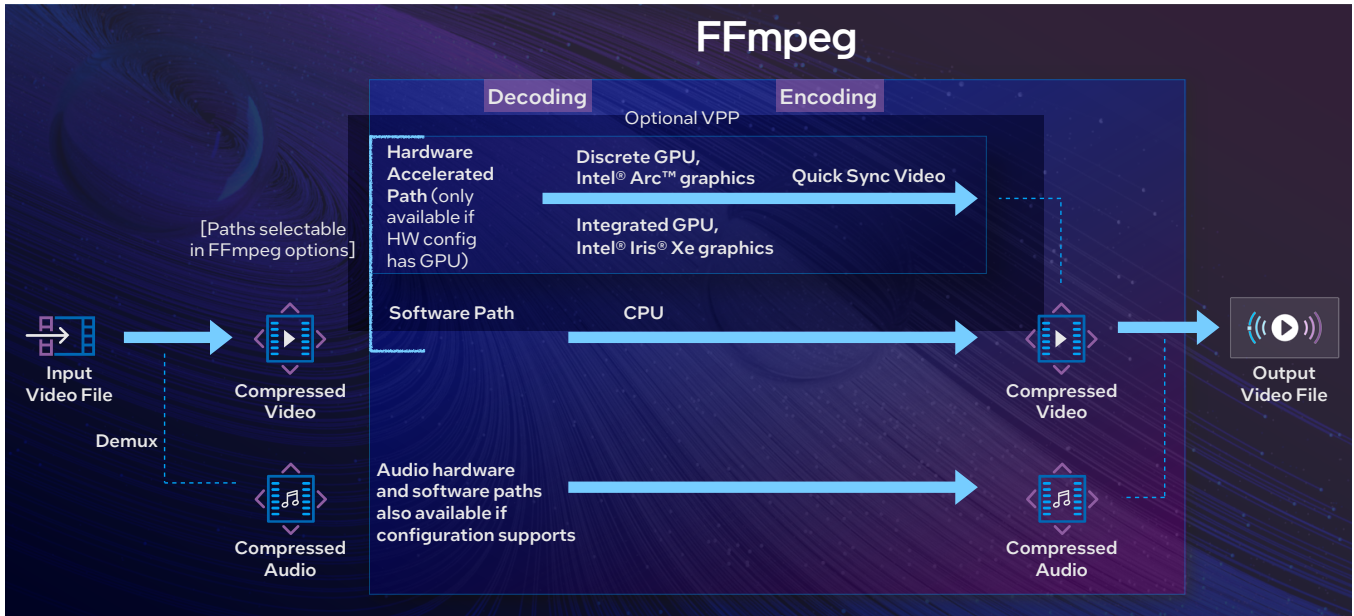


Figure 1. Flowchart of FFmpeg transcoding at a high-level

FFmpeg Support for Intel Quick Sync

FFmpeg developers ensured integral support for Intel Quick Sync Video (Intel QSV), a dedicated hardware core incorporated in all discrete and integrated Intel Graphics products since 2011. The release of the Intel Arc CPU series and 12th Gen Intel Core processors delivers another area in which the video processing tools enabled by FFmpeg can be accessed through Intel QSV, providing accelerated video encoding and decoding, and other processing enhancements.

Codecs Available Through FFmpeg

FFmpeg is exceptionally portable, supporting a broad array of file types, libraries, and formats. When viewing video online, FFmpeg transcoding operations break down a stream into frames and then encodes to a chosen compressed

file format (see Figure 1). Both hardware accelerated and software encoding and decoding are supported. FFmpeg can be used directly rather than the codecs themselves, and can ingest one input and generate multiple outputs.

Codecs supported by FFmpeg include AVC, HEVC, and AV1 encoding and decoding. The Hyper Encode capabilities through Intel Arc graphics products are also supported.

The X^e microarchitecture of Intel Arc when using AV1 encoding uses acceleration to produce exceptionally high-quality video for viewing or game streaming while requiring less storage space for assets. The speedy, open-source Scalable Video Technology AV1 encoder and decoder operates with all modern processors. Figure 2 compares the quality of AV1 at a lower bitrate than H.264 with similar quality.

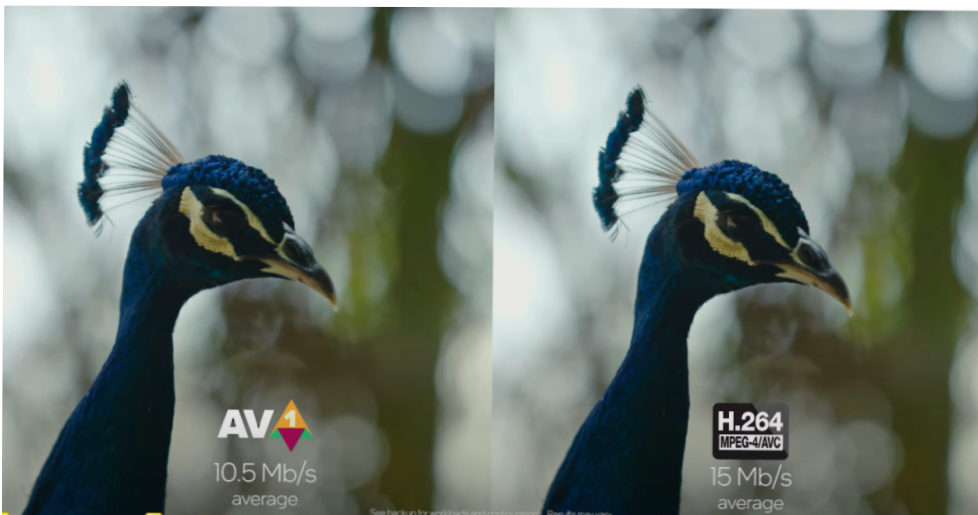


Figure 2. Use of the AV1 codec lowers bitrate but maintains quality²

For Creators – Less Time Waiting

Hyper Encode speeds results when using multiple media engines on the Intel Core processor or Intel Arc graphics, working in combination in laptop or desktop systems. For example, up to 60 percent faster single-stream encoding can be gained on CyberLink PowerDirector with Hyper Encode on rather than off.³

Resources

Intel Graphics Packages on GitHub

The Intel upstreamed, unmerged packages are accessible on [this staging area of the GitHub repository](#).

What is Intel Quick Sync Video?

Intel Quick Sync Video uses dedicated media processing capabilities of Intel Graphics Technology for high-performance decoding and encoding. Processors are freed up to handle other tasks, improving overall system responsiveness.

[Watch the video >](#)

New Intel Arc graphics solutions

Intel Arc graphics solutions are built to deliver exceptional, high-performance gaming and streaming, as well as rich creative opportunities.

[Learn more >](#)

Boosting Battery Life

Viewing streaming video takes a toll on battery life. Laptop users especially can appreciate the open-source VLC video viewer that supports Intel hardware acceleration via FFmpeg to extend battery life for longer entertainment experiences.

About FFmpeg

FFmpeg is a community-built, open-source, cross-platform solution to record, convert, and stream audio and video content. FFmpeg provides comprehensive audio and video format support, from the most obscure ancient formats up to the cutting edge. The extensive portability engineered into FFmpeg includes Linux, Mac OS X, Microsoft Windows, the BSDs, Solaris, and so on, working under a wide range of build environments, machine architectures, and configurations.

[FFmpeg.org](#)

Alchemist, the first generation of Intel Arc products, features hardware-based ray tracing, offering full support for DirectX 12 Ultimate and AI-driven Xe Super Sampling. Based on Intel's Xe-LP, HP, and HPC microarchitectures, the family of products delivers scalability and compute efficiency with advanced graphics features.



1. FFmpeg 5.0. Techspot. January 2022.

<https://www.techspot.com/downloads/6447-ffmpeg.html>

2. AV1 vs AVC | Intel's data center GPU (codenamed Arctic Sound-M). YouTube video. May 2022. <https://www.youtube.com/watch?v=nRfelgy3NsY>

3. Performance varies by use, configuration, and other factors. Learn more at www.intel.com/PerformanceIndex.

Intel is committed to respecting human rights and avoiding complicity in human rights abuses. See Intel's [Global Human Rights Principles](#). Intel® products and software are intended only to be used in applications that do not cause or contribute to a violation of an internationally recognized human right.

Intel does not control or audit third-party data. You should review this content, consult other sources, and confirm whether referenced data is accurate.

Intel technologies may require enabled hardware, software, or service activation.

No product or component can be absolutely secure.

Your costs and results may vary.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.

0622/BL/MESH/PDF

351678-001 US