

AV1 Encoding for Aviation



In tests, AV1 encoding demonstrated a range of benefits for higher quality content such as that offered through the latest generation of IFE systems

At the end of 2022, a little-known [APEX](#) publication on AV1 encoding was submitted for comments by an APEX Tech working group. The document was the result of nearly two years of volunteer research and development, encoding input from Google and V-Nova, as well as some empirical research performed by [IdeaNova](#).

Presently, there is a lack of AV1 support on Safari browsers on Apple products which is the main hurdle streaming companies are facing when trying to deliver single files across the majority of consumer devices. But it appears that Apple will support AV1 encoding in the next generation of iPadOS and macOS.

As AV1 encoding grows in popularity, this study confirmed that it's a viable choice to not only reduce file sizes, and to do so with high-quality content, but also decrease encoding time as well.

For custom-built installed IFE systems, built-in CODEC support in the hardware is vital to keep power consumption down. While HEVC support has been available since 2017, AV1 HW support is just two years old, so it might only be found in the newest IFE systems. Because IFE systems have long lifetimes, the industry will continue to need to supply H.264 and HEVC content for some time. For those systems that support AV1, though, it may be possible to have one media file for both PEDS and installed seatbacks.

The study created five content files, representing a range of commonly used formats as well as those airlines may use in the future. Each reflected a wide range of fast scenes and colour-deep images.

Encoding

These content files were encoded with HEVC and AV1 to compare compression efficiencies as observed by file size. The ffmpeg integrated x265 encoder was used to create HEVC files to be

compared with the results produced by AV1 encoders, while SVT-AV1, (version 1.1.0) originally developed by Intel was used for encoding the sample content.

The higher the preset, the better the compression and AV1 encoding used single pass with preset 6 (the largest preset that could be used in this experiment) with variable bitrate encoding mode. Similarly, the number of passes did not improve any of the expected results and appeared to just increase the encoding times.

Testing

The study used VMAF — an objective method of analyzing the quality of video content developed by US universities in partnership with Netflix, that relies on comparison with a reference file with the original. The VMAF functionality built into ffmpeg was used to calculate the VMAF score.

Conclusion

AV1 encoders are a welcome addition to the toolset used by aviation companies to deliver higher-quality content with the least amount of bandwidth. These encoders produced the desired results: saving between 35 to almost 40 percent of disk space — a commodity in high demand considering hard to replace, aging aircraft hardware and the proliferation of new content produced by Hollywood studios, SVOD vendors, and independent producers. During testing, the versions of AV1 encoders have changed frequently, improving performance with each new update. This shows that companies are devoting efforts to advancing this technology.

AV1 encoders could be great for companies who design seatback entertainment, a contained ecosystem which can therefore be guaranteed to provide hardware-level support for AV1 decoding. The barrier right now is waiting until Apple announces AV1 support in their devices, considering Apple iOS and iPad devices represent a large portion of electronic devices passengers bring on aircraft.

A new trend in the encoding industry is to monitor the carbon footprint content processing operations leave on the environment. This might be less of a concern for the aviation industry, where a single encoded file is watched by millions of users, as opposed to social media companies with frequent encoding of ever new content. However, this consideration might become more prominent with shrinking content upload cycles and demand for newer content. Considering lower encoding times for higher quality content and ever-increasing device support, which minimizes the number of files to encode, AV1 might be a sensible option for environment sensible streaming.

This is an abridged version of a wider article written by Juraj Siska, co-founder of IdeaNova and Janne Pelkonen, CTO, IdeaNova Technologies.