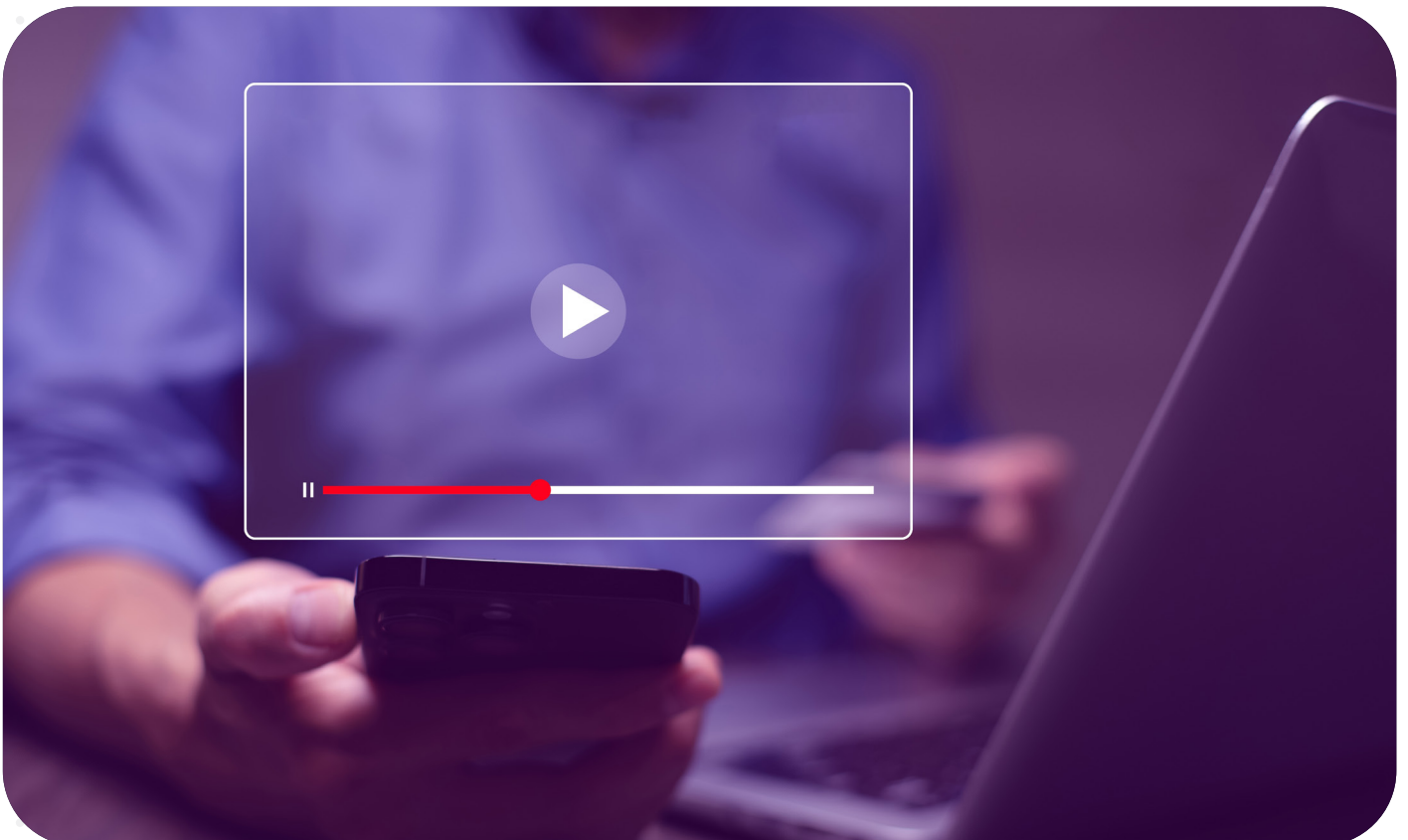# VIDEO TRANSMISSION OVER MOBILE NETWORKS

Overcoming the challenges of standards-based video codecs

Digital Barriers Whitepaper | MAY 2024

CONTENTS

ADDRESSING THE EXPLOSIVE RISE OF VIDEO TRAFFIC

The growth of video traffic has been exponential over the past several years, driven by a range of emerging trends and technology factors…

- **Increased video consumption.** Popular streaming services, social media platforms, video conferencing tools, online education software and other applications heavily rely on video content.

- **Mobile data usage.** The widespread use of smartphones and mobile devices means more people are accessing video content on the go.

- **Video surveillance and IoT applications.** Video surveillance systems and IoT devices incorporating HD cameras have become more prevalent.

- **Cloud-based video services.** Cloud-based video services are growing popular, allowing users to store and access their videos from anywhere.

- **Adaptive, real-time video streaming and communication.** Live events, webinars, video conferencing and gaming have all become commonplace. Adaptive streaming techniques have also become popular, especially for online video platforms.

- **User expectations.** Users have come to expect high-quality video content across various platforms, devices and use cases — from VR and AR applications to surveillance systems.

Global video traffic usage grew 24% in 2022, equating to 65% of all internet traffic.
Sandvine 2023 Global Internet Phenomena Report

This surge in video consumption has created a significant need for efficient video codecs that can create new opportunities for experiences, savings and differentiation.

To cater to ever-increasing video traffic, video codec developers continuously work to improve existing solutions and develop new ones with better compression efficiency and support for advanced features.

These efforts aim to provide an optimal video viewing experience whilst minimising bandwidth and storage requirements — in a world where video consumption is crucial to digital communication and entertainment.

WHAT ARE VIDEO CODECS?

Video codecs are software or hardware algorithms that compress and decompress video data for storage, transmission and playback. The word 'codec' combines 'coder' and 'decoder', as these algorithms encode (compress) video data and then decode (decompress) it back to its original form. So, why do we need them?

Video files can be huge and consume significant storage space and bandwidth. Through codecs, videos can be efficiently compressed without substantial loss of quality — making it easier to store, transmit and stream video content over the internet.
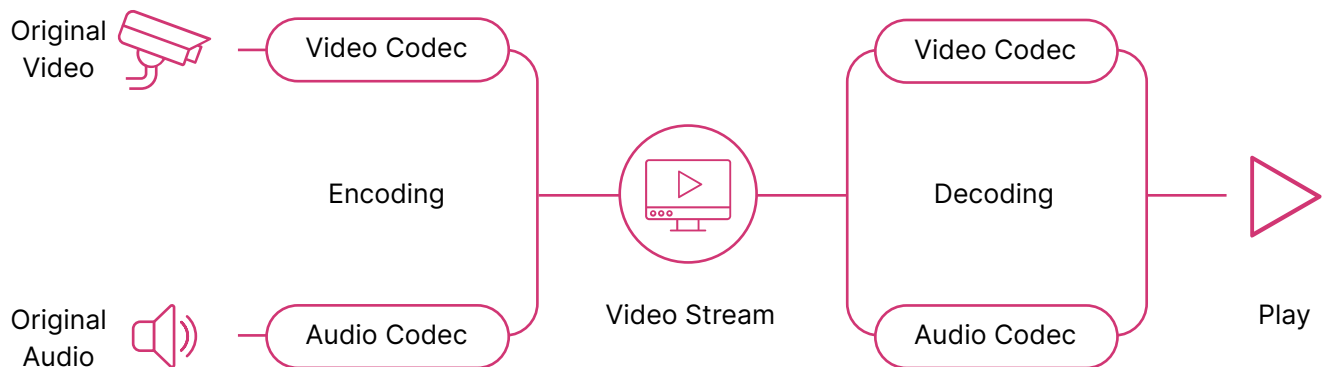
Lossy codecs

These codecs achieve higher compression ratios by permanently discarding some video data. The discarded data can't be fully recovered during decoding, resulting in some video quality loss. However, modern lossy codecs are designed to minimise the impact on visual quality, making the loss often invisible to the human eye. Popular examples of lossy codecs include H.264 (AVC), H.265 (HEVC) and VP9.

Lossless codecs

Unlike lossy codecs, lossless codecs preserve all the original video data during compression, ensuring no loss of quality. The tradeoff is that lossless compression typically results in larger file sizes than lossy compression. Some well-known lossless codecs are Apple ProRes, Avid DNxHD and FFV1.

Different codecs are suitable for different use cases. For example, lossy codecs are commonly used to stream videos online, as they balance video quality and file size well. Lossless codecs are often used in professional video editing and archival purposes, where preserving the highest quality is crucial, even if it requires larger storage capacities.

Overall, video codecs are vital for the efficient, widespread and seamless distribution and consumption of video content in today's digital age. They strike a balance between maintaining video quality and reducing file sizes, making it possible to enjoy high-quality videos across various devices and platforms.

WHAT ARE THE LIMITATIONS OF STANDARD VIDEO CODECS?

Video codecs such as H.264 (AVC) and H.265 (HEVC) — the most common standard video codecs for real-time video transmission — aren't designed for mobile environments and have trouble delivering the same results when operating in these contexts due to several challenges...

Bandwidth limitations

Both H.264 and H.265 can deliver high-quality video. However, their higher compression efficiency can result in higher data rates for the same video quality compared to older codecs. This can be a challenge in mobile networks with limited bandwidths, potentially leading to buffering or reduced video quality.

Latency

Real-time video communication applications may face latency challenges with both codecs, as the encoding and decoding processes introduce delays. Whilst H.265 is more efficient, the latency introduced by both codecs can still be a concern.

Adaptive streaming complexity

Adaptive streaming techniques are essential to adjust video quality based on available bandwidth. However, implementing adaptive streaming with H.264 and H.265 can be more complex than with older codecs because of differences in their encoding and decoding processes.

Network costs

Encoding high-resolution videos with H.264 and H.265 can increase data usage, potentially resulting in higher data charges. This could be an issue for both content providers and end-users.

Network congestion

Mobile networks can experience congestion during peak hours, reducing bandwidth availability. Both H.264 and H.265 need to adapt to changing network conditions to ensure smooth video playback.

Reliability and user experience

When network-related issues (constrained bandwidth, high latency and packet loss) arise, H.264 and H.265 become unreliable, impacting the user experience and leading to operational challenges and undesirable business outcomes.

Battery consumption

Decoding H.264 and H.265 videos requires significant computational power, leading to increased battery consumption on mobile devices. Although H.265 is more efficient than H.264, the decoding process can still impact battery life, especially on devices with limited processing capabilities.

Despite these challenges, H.264 and H.265 are the leading video codecs used today, as there are no standards-based video codecs designed for mobile environments. Until now...

INTRODUCING AI-BASED VIDEO CODEC

Digital Barriers' AI-based, military-grade video codec can deliver reliable real-time video over cellular without compromising quality.

Designed specifically for mobile environments, our codec has been tried and tested in the field — proven to help organisations reduce their bandwidth costs by up to 90% whilst operating in constrained or congested networks.

How does it work?

The Digital Barriers AI-based video codec is network-aware and can self-optimise compression levels based on dynamic frame-by-frame network conditions. Users can specify a minimum and maximum bandwidth to wirelessly deliver reliable, accurate video with almost zero latency — even at bandwidths as low as 10 Kbps.

Unlike conventional video codecs unsuitable for transmission over cellular, this solution can address the challenges of ensuring video quality and reliability in congested or remote environments, leading to significant business impacts.

✓ Overcome bandwidth limitations

Operate over high-interference or restricted-bandwidth networks (ranging from sub-100 Kbps to 500 Kbps) whilst supporting full PTZ controls.

✓ Reduce video latency

Use customer-set thresholds (min/max) to minimise spikes and latency buildup.

✓ Manage adaptive streaming complexity

Enable compression and network encoding to any ONVIF-conformant camera.

✓ Optimise network costs

Harness AI-based wireless video codec to save bandwidth and allow further use.

✓ Minimise network congestion

Set precise rules on bandwidth usage to deliver real-time video services over congested fixed networks without disrupting other business-critical services.

✓ Improve reliability and user experience

Ensure expected outcomes with end-user controls, such as video frame rates and maximum bandwidth transmission.

For more information about our AI-based video codec, please contact hello@digitalbarriers.com.