Addressing the shortcomings of standard video codecs over mobile networks with Vodafone Business Connected Spaces Vision

Connected Spaces Vision

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The growth of video traffic has been exponential over the past several years, driven by various factors such as increased internet penetration, improved network speeds, the proliferation of smartphones and the popularity of video streaming platforms. This surge in video consumption has created a significant need for efficient video codecs.

In this article, we'll provide insights into what video codecs are, the challenges with standard video codecs over mobile networks and how Vodafone Business Connected Spaces Vision is addressing these challenges while creating new opportunities for experiences, savings and differentiation for organisations like yours.

Lights, camera, connectivity: the explosive rise of video traffic

Sandvine's 2023 Global Internet Phenomena Report, the recognised authoritative source for global application usage and internet traffic trends, shows that global video traffic usage grew 24% in 2022, now equating to 65% of all internet traffic.

Per Ericsson Mobility Report from June 2023, video traffic is estimated to account for 71 percent of all mobile data traffic, and this share is forecast to increase to 80 percent in 2028.

The surge is a result of various factors such as:

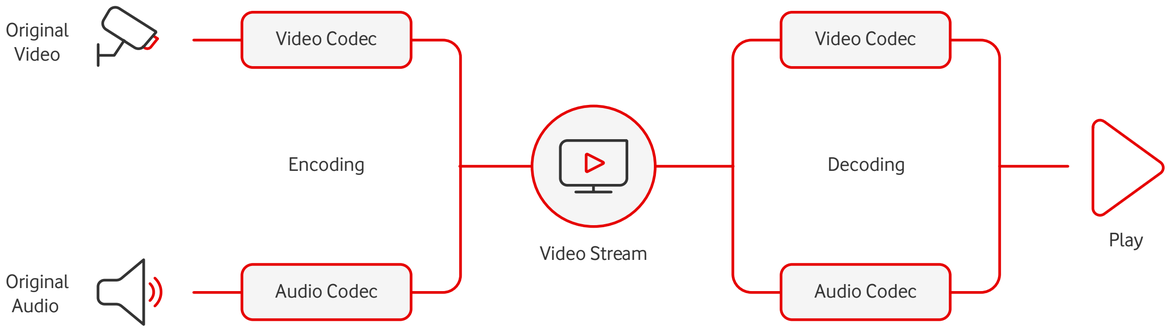
- **Increased video consumption**
  People are now consuming more video content than ever before. Video streaming services, social media platforms, video conferencing, online education and other applications heavily rely on video content.
- **Mobile data usage**
  With the widespread use of smartphones and mobile devices, people are accessing video content on the go.
- **Video surveillance and IoT applications**
  Growth in video surveillance systems and Internet of Things (IoT) devices incorporating cameras have become more prevalent.
- **Cloud-based video services**
  Cloud-based video services have gained popularity, allowing users to store and access their videos from anywhere.
- **Live streaming and real-time communication**
  Live streaming events, webinars, video conferencing and live gaming have become commonplace.
- **Adaptive streaming**
  Adaptive streaming techniques have become popular, especially for online video platforms.
- **Virtual Reality (VR) and Augmented Reality (AR)**
  VR and AR applications require high-quality immersive video content.
- **User expectations**
  Users have come to expect high-quality video content across different platforms and devices.

To meet these challenges and cater to the ever-increasing video traffic, video codec developers continuously work on improving existing codecs and developing new ones with better compression efficiency and support for advanced features. These efforts aim to provide an optimal video viewing experience while minimising bandwidth and storage requirements in a world where video consumption is a central part of digital communication and entertainment.

Cracking the codec code

Video codecs are software or hardware algorithms used to compress and decompress video data for storage, transmission and playback purposes. The word “codec” is a combination of “coder” and “decoder,” as these algorithms encode (compress) video data and then decode (decompress) it back to its original form.

Video codecs are essential because video files can be very large and can consume significant storage space and bandwidth. By using codecs, videos can be efficiently compressed without significant loss of quality, making it easier to store, transmit and stream videos over the internet.



Lossy codecs	Lossless codecs
These codecs achieve higher compression ratios by permanently discarding some video data. The discarded data cannot be fully recovered during decoding, which results in some loss of video quality. However, modern lossy codecs are designed to minimise the impact on visual quality, making the loss often imperceptible to the human eye. Popular examples of lossy codecs include H.264 (AVC= Advanced Video Coding), H.265 (HEVC= High Efficiency Video Coding) and VP9.	Unlike lossy codecs, lossless codecs preserve all the original video data during compression, ensuring no loss of quality. The trade-off is that lossless compression typically results in larger file sizes compared to 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 for streaming videos online, as they provide a good balance between video quality and file size. 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.

Video codecs and the mobile conundrum

Video codecs such as H.264 (AVC) and H.265 (HEVC) – the most common standard video codecs for live video transmission – are not designed for mobile environments and have trouble delivering the same results when they operate in that context due to a number of challenges they face.

What are these challenges?

Bandwidth limitations

Both H.264 and H.265 can deliver high-quality video, but 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 bandwidth, 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. While H.265 is more efficient, the latency introduced by both codecs can still be a concern for real-time applications.

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 due to differences in encoding and decoding processes.

Network costs

High-resolution videos encoded with H.264 and H.265 can lead to increased data usage, potentially resulting in higher data charges. This could be a concern for both content providers and end-users.

Network congestion

Mobile networks can experience congestion during peak hours, leading to reduced 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. This can lead 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. While 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 main video codecs used today, as there are no standards-based video codecs designed for mobile environment.

Vodafone Business Connected Spaces Vision – in partnership with Digital Barriers (DB)

Using Digital Barriers' Artificial Intelligence (AI)-based, military-grade video codec, Vodafone Business Connected Spaces Vision can provide reliable, robust, resilient live video delivery over Vodafone mobile networks.

Designed specifically for mobile environment, Digital Barriers' video codec can deliver reliable live video over a mobile network without sacrificing quality. Based on proven field testing, organisations can see anywhere from 70% to 90% of bandwidth savings depending on the video environment while operating in a constrained and congested mobile environment.

So, what's driving the need for this solution?

Conventional video codecs, such as H.264 and H.265, are not designed for transmission over constrained or congested networks. This results in significant challenges in terms of video quality, dropped frame, unreliable delivery of video, leading to significant business impacts.

Why Digital Barriers' video codec works better in a mobile environment

The DB AI video codec is network-aware and can self-optimise the compress level based on dynamic frame-by-frame network conditions. Since you can specify a minimum and maximum bandwidth, reliable and usable video is delivered wirelessly with almost zero latency – even at bandwidths as low as 10kbps.

Bandwidth limitations: High interference or restricted bandwidth networks – sub-100kbps-500kbps range –, while still supporting full PTZ (pan, tilt, zoom) controls.

Latency: Using customer set thresholds (min/max); minimising spikes and latency build-up.

Adaptive streaming complexity: AI-based, enabling compression and network encoding to any Open Network Video Interface Forum (ONVIF)-conformant camera.

Network costs: DB technology over wireless enables bandwidth utilisation savings, allowing further use

Network congestion: Ability to set precise rules on bandwidth to be used per video stream results in confidence to deliver real-time video services over congested fixed networks without risk of disruption to other business-critical services.

Reliability and user experience: End user controls (video frame rates and maximum bandwidth transmission) ensure expected outcomes.

Get in touch to discover more about Connected Spaces Vision

To learn more about our Connected Spaces Vision portfolio and how it can bring value to your organisation, please reach out to your account manager for more information, or get in contact through our website page - https://www.vodafone.co.uk/business/iot/connected-spaces