WHITE PAPER

H.265...
The Best Compression, or is it?

Secure Logiq delves into the rising trend of H.265 adoption and its implications for video compression standards.

Sources used in the making of this whitepaper:

Wikipedia - High Efficiency Video Coding
Code Sequoia - HEVC CTU, CU, CTB, CB, PB, and TB
IPVM - Hikvision H.265+
Sonnati - H.265 Part I: Technical Overview

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What is H.265?

Recently at Secure Logiq, we have seen an increase in the number of projects where people are requesting H.265 as their standard compression codec. H.264, H.265 and their respective smart codecs such as H.264+ are all supported by Secure Logiq hardware as the codec is about video transmission and not about the hardware components in the box. This document provides a general outline of the pros and cons of using H.265 and its smart variants.

H.265, also known as High Efficiency Video Coding (HEVC), or MPEG-H Part 2, is a video compression standard designed to succeed H.264, also known as Advanced Video Coding (AVC), or MPEG-4 Part 10. On paper, when compared to H.264, H.265 offers 25-50% better data compression at the same level of video image quality, or improved image quality at the same bitrates.

What are the technical differences?

The three main areas where improvements have been made that allow H.265 to perform better are:

1. Block pixel referencing, meaning the codec allows same-frame and other-frame references, intra-prediction, and inter-prediction respectively.
2. H.265 allows for parallel decoding, meaning that it can take advantage of multiple cores on a CPU to process different parts of the image simultaneously.
3. Macroblock sizes are replaced with CTUs (Coding Tree Units). H.264's maximum block size is 16x16 pixels (256). H.265's maximum block size is 64x64 pixels (4096). Larger block sizes enable efficient encoding, especially as the resolution increases.

The advantage of item 3 is that the CTU can be encoded as a single block, or it can be split into smaller blocks. For a visual representation, please see Figure 1.

For more information or a technical overview on CTU please see here or here.

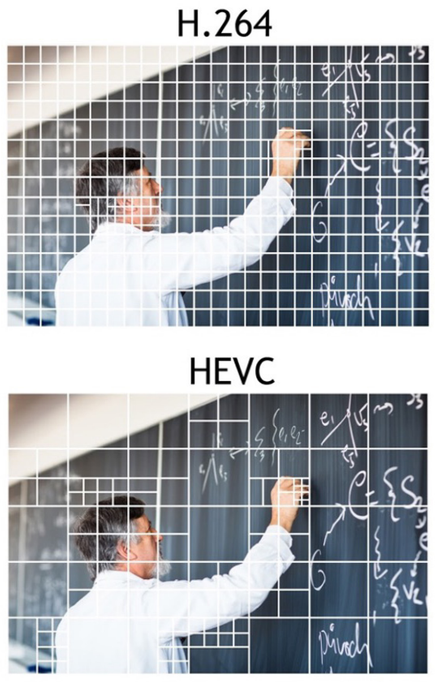

Figure 1 - Macroblock/CTU comparison

So, what's the bad news?

While lower bandwidth and therefore reduced storage requirements are beneficial, as they can decrease overall costs or, preferably, enhance quality without increasing costs, there are other factors to consider.

IPVM.com reported in an article that the increase in processing requirements ranged from 50% to 300% greater than with equivalent H.264 cameras. While this may be achievable on some hardware at an additional cost, based on our experience, we believe that most installations will require additional hardware rather than just upgrades. For instance, if you take an existing client machine with an Intel Core series processor capable of displaying 50 1080p streams at 12 FPS, you may be able to increase the CPU performance by 50%, but doubling the performance would necessitate doubling up the machines used.

In recent years, the use of GPUs, known as hardware acceleration/hardware decoding, in both server and client hardware has increased the VMS's capability to handle less compression, more frames, or higher resolution. However, almost no GPUs support H.265 hardware decoding, meaning that the full system load will have to be borne by the CPU. For existing systems, this may imply that the current hardware, which is functioning well, will not be adequate if converting the cameras to H.265.

H.265 has not been as widely accepted by camera and VMS manufacturers compared to the adoption of H.264. Compatibility issues persist, necessitating additional checks to ensure that cameras will indeed be supported on the VMS using H.265 or H.265+.

What's the middle ground?

The middle ground could be to revert to using an H.264 smart codec. Through testing, we found that the bandwidth savings of Axis Zip stream, which is an H.264 smart codec also called H.264+, were significant without imposing a disproportionate amount of processing strain on the hardware.

We recommend avoiding the H.265 standard as H.264+ actually provides better results at a lower cost. While H.265 offers the benefit of lower bandwidth, it comes at the expense of much higher processing capacities.

If you are planning on using server-side motion recording for the time being, we would advise you to steer clear of H.265 altogether.

As with all surveillance system calculations, it's essential to use a calculator that you trust. We have seen calculators that simply deduct a fixed percentage from the requirement, which is incorrect. This is not how it works, and they fail to account for the increase in processing required.

Need help? Please contact us.