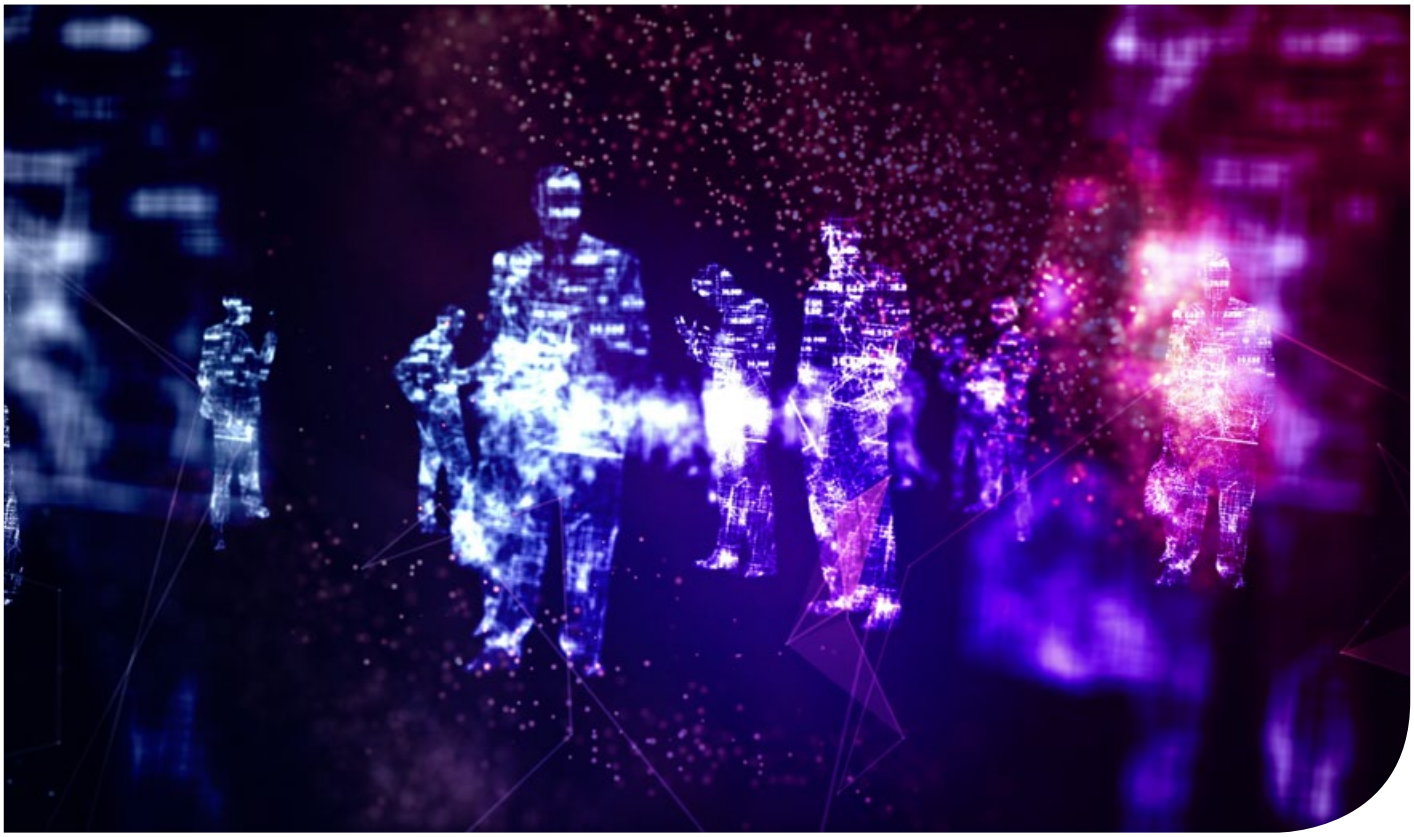
Understanding H.265

The new standard for video coding



What is H.265?

H.265, or High Efficiency Video Coding (HEVC) as it is sometimes referred to, is the latest standard in video coding and is an advancement of H.264, also known as Advanced Video Coding (AVC). The ultimate aim of this standard is to offer the same, or improved, picture quality but with increased compression efficiencies to make large data files more manageable and reduce the overall storage burden.

Estimates vary regarding the potential savings, as multiple factors will impact real-world results, but as a guideline field tests commonly show that H.265 can decrease bit rate requirements and associated storage needs by approximately 30% with no loss to video quality. Similarly, retaining the same bit rate enables much-improved image quality.

How does H.265 compression work?

H.265 compression is based on the same principles as H.264 i.e. rather than encoding every pixel from every frame, bandwidth usage is minimized by identifying static areas (that do not alter from frame to frame) so that detailed encoding can be applied to areas that are actually changing.

The difference is that with H.265 this process is more aggressive. As well as expanding the areas examined for changes or pattern comparison from 16 x 16 pixel to sizes up to 64 x 64, capabilities such as motion compensation, spatial prediction, and sample adaptive offset (SAO) image filtering have all been enhanced as part of the compression algorithm.

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Why has H.265 been introduced now?

The arrival and adoption of 4K technology has been a key driver in the development of H.265. In simple terms, 4K cameras could result in files four times bigger than normal 1080p (Full HD), which has huge implications for how that data is handled.

Until now, compressing 4K camera footage in order to reduce bit rate for faster streaming and reduced storage requirements has often resulted in poorer picture quality than less heavily compressed HD footage. With H.265, that problem can, in theory, be eliminated. However, the caveat 'in theory' is important here as there are drawbacks associated with adopting H.265.

The problems with H.265

While H.265 is technically available, mass adoption is still a distance away because the superior compression capabilities are accompanied by other important considerations and factors.

Processing power

To compress images more aggressively, increased processing is required, and that in turn uses more power. Some authorities on the topic estimate that the added encoding complexity of H.265 requires up to 10 times more computing power than H.264.

Latency

The more complex the encoding algorithm, the greater the image latency. Also, decompression has to be factored in i.e. decoding the data into a usable, viewable image. The more complex the encoded video is, the longer this takes. Where real-time image monitoring is a key requirement, this impact in terms of latency can be a significant issue, effectively ruling out H.265 adoption where low latency is critical for the time being.

Multi-screen limitation

In real-world conditions, the increased processing power needed for H.265 reduces capacity for simultaneous live view and playback. While this may be acceptable for single-scene applications (e.g. where monitoring is focused on a single entrance or exit), for large-scale surveillance solutions where control room operators are used to viewing up to 16 cameras simultaneously as standard, they may now discover they can only view four.

Camera control

Live PTZ camera control will be hampered by the latency and decompression lag. This could limit usage in environments such as casino floors, where rapid movement to monitor fast-paced incidents is vital.

Hardware upgrade

Processing and rendering images compressed using H.265, certainly for surveillance solutions of any scale such as large camera volumes, is not simply a case of adopting new software. It will necessitate significant hardware upgrades in terms of both camera technology and back-end setup e.g. recording and display. In other words, 4K cameras and H.265 exist, but at present the technology involved in end-to-end surveillance solutions is simply not powerful enough to capitalize on the benefits that H.265 would offer without significant investment.

Does Synectics offer a way to start benefiting from H.265?

Yes. While hardware upgrades will be required by those adopting H.265, the latest evolution of our Synergy 3 command and control solution supports H.265 compression in terms of recording, playback, and live view. Our IP cameras also support both H.265 and H.264.

We have introduced enhanced dual-streaming capabilities using our cameras and Synergy 3 command and control platform. This will effectively enable a 'best of both worlds' approach where H.264 can be used for live streaming, while H.265 can be used for high-quality recording with reduced storage.

Will H.264 be phased out quickly?

No, operators will have time to transition to H.265. Given that many earlier methods such as MPEG4, H.263, H.261, Wavelet, MJPEG etc. (predecessors to H.264) are still operational and widely used, we anticipate that it will be many years before the switch is necessary. For the foreseeable future, new technology introduced to the market will enable optional use of H.265 but still support other encoding standards or techniques.

Conclusion

H.265 has been created to reduce the bandwidth and storage requirements of video, which is ideal for organizations and industries that traditionally use single camera display setups and have time to process footage. When it comes to high-channel, large-scale surveillance applications, latency and decompression challenges will need to be addressed to enable H.265 to become viable. With the forthcoming introduction of camera and display hardware capable of increased processing power, the viability of H.265 increases.

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