

Vigitron IP Infrastructure Design Educational Series



Transmitting and Other 4K Camera Considerations

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Since last year, there have been a lot of discussions in regard to 4K resolution IP security cameras. As with any advancement in video security, this has come about due to advances in consumer electronics. While being the “latest and greatest”, it still raises questions as to actual practical every day usage and its usage for video security applications.

What is 4K? Back in the day, HDTV was defined as 1920 pixels by 1080 pixels resolution. Thus, came the name “1080P”. The P stands for progressive scanning. The main concern results from the multiple of these numbers (or 2 million), which equals the minimum bandwidth to transmit an image must be at least 2Mbps. 4K is four times that number, which translates to a minimum of at least 8Mbps required to transmit an image. This wouldn't be a concern if it wasn't for the fact that security observations deal with motion and motion deals with multiple images over the period of a second.

This raises questions such as how to view 4K, how to record it, and how to transmit it between the image source and the recording/viewing points. These questions place significant stress on existing IP infrastructures. The simplest solution is to upgrade the networks to 10Gbps, but this solution overlooks the cost, viewing and recording aspects. The reality is camera manufacturers have already taken this into account. In some cases, cameras offer the ability to view signals by reducing the signal down to 1080P, while maintaining 4K for recording.

To better understand the challenges of 4K for security, let's take a closer look at the signal. As previously stated, 1080P is 1920 x 1080 pixels, whereas 4K is four times this or 3840 x 2140 pixels. While there are no standards that apply to video security applications, 4K does have standards defined by the International Telecommunications Union (ITU). Taking into considerations the need of security applications to be “real time” or as close to 30 images per second, the total required bandwidth for 1080P single at 30 images per second would be 93Mbps. For 4K, the total required bandwidth increases to 373Mbps. Both of these figures would be impossible to deal with given current viewing and recording technology. However, when we apply the current standard compression method of H.264 (which is generally 50:1), the bandwidth for 1080P is reduced to about 2Mbps and 8Mbps for 4K.

Please note that while there are standards, they do not apply to how any individual camera or VMS provider applies it to their product. This is the reason different IP camera manufacturers have different and often incompatible drivers for resolving their cameras.

Transmission and bandwidth play a critical role in this. The average packet overheads will approximately take up to 50 percent of a transmission systems available bandwidth. Thus, a transmission speed of 10Mbps only has about 5Mbps available for image transmission (a 100Mbps transmission speed only has about 50Mbps). If the basic highest compression H.264 bandwidth already requires at least 8Mbps, you can immediately eliminate the use of any part of the system that only operates to 10Mbps. The number of 4K cameras at 100Mbps in any transmission line can safely be limited to four. Differences will result from other factors such as the number of images per second produced by the camera.

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The most critical factor is to take into consideration every aspect of your transmission system. Consider that when it comes to connecting the camera's 100Mbps output port to your network switch, the port must be able to resolve Jumbo Frames up to 9600bytes. The output network speed of the camera must match the input port speed of the switch. Most network switches can only resolve up to 1518bytes at 100Mbps, a figure that is not adequate for 4K camera transmission. Then, consider your transmission line. Regardless of the type of medium used, it must have a consistent bandwidth from one end to the other. As your device's bandwidth increases, the network transmission losses become even more critical.

While viewing and recording, the device performance can usually be judged by their specifications provided by the manufacturer. Transmission is often more difficult due to the various components involved. Prior to designing a system that involves 4K devices, make sure that the transmission provider you're working with can justify their performance and can provide support in the event you required it. 4K places extra demands on video security, but the results can be quite rewarding.

Vigitron Advantages and 4K Cameras

Vigitron products have several advantages that assure proper performance for systems using 4K cameras. These advantages are contained in Vigitron's engineered technology:



Symmetric Bandwidth™

Symmetric Bandwidth™ ensures that bandwidth is maintained throughout the transmitted distance critical for high resolution images. Regardless of the physical method used to transmit bandwidth, losses are limited to approximately one percent.



Jumbo Frame Compatibility™

4k images require large packet sizes. Network products and most products offer extended distance transmission are tested at only 64bytes, a size that doesn't even meet the requirements of one megapixel non-4K cameras. Vigitron products are designed and tested at full 9600bytes. They are the only products certified for IP camera transmission up to 29 megapixels.



Virtual Zero Packet Loss™

Virtual Zero Packet Loss™ ensures that all video packets (video frames) are properly transmitted up to the limit of Jumbo Frames size at 9600 bytes. This is critical for proper reproduction of any IP camera, particularly for cameras with 3 megapixels and greater image sizes, and all 4K cameras.



Certified

As an engineering company, Vigitron does not make performance claims without certification testing. Testing for each claim is made on multiple levels and repeated at least three times to assure accurate results. With Vigitron, you can rest assured that the quality claimed is the quality you will receive.



VIGITRON

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Network PoE Switches

Vigitron's Vi3010, Vi3026, and Vi3326 are first network switches built specifically for IP cameras. These are bandwidth performance certified for high Megapixel and 4K cameras.

Vi3000 Series



Transmission Solutions

Vigitron offers transmission solutions for UTP to coax. UTP and single pair transmission are tested and conform to SBW™, JFC™, and VZPL™ performance standards.

Vi2400 Series



Vi2300 Series



Vigitron offers free and without obligation Design Center Services staff by trained factory engineers. To access Vigitron's Design Center, click [here](#) or direct any questions on any Vigitron related subjects to support@vigitron.com.

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