

SECURITY SALES & INTEGRATION PARTNER SERIES



**HDCVI ADVANCES DELIVER
4K RESOLUTION OVER
COAXIAL CABLE
INFRASTRUCTURE**

dahua
TECHNOLOGY



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The application of 4K UHD video over coaxial cabling is providing installing security contractors the opportunity to cost-effectively upgrade existing customers who desire the highest quality video imaging. For many applications across various markets, the user's legacy infrastructure can be utilized, thereby making for attractively priced retrofits.

Achieving high definition (HD) video over existing coaxial infrastructure may not be a novel quest in the security industry, but it is finally a compelling solution to offer end customers who demand no less than the highest quality surveillance imaging. No less compelling for installing security contractors is the mass base of existing legacy video surveillance systems that are ripe to be efficiently and cost-effectively upgraded with HD cameras and accompanying storage devices. Consider: The installed base of security cameras in North America was forecast

to grow from 33 million in 2012 to nearly 62 million devices by the end of 2016, according to IHS Markit. While the market for video surveillance cameras continues to rise the product mix is changing, according to the research firm. Network security cameras accounted for 17% of the total installed base in 2012, but were forecast to account for 34% of the market by the end of 2016. HD CCTV cameras — including HDCVI, AHD and HDTVI — have also increased their market footprint, from less than 1% in 2012 to almost 13% in 2016. In 2016, for the first time, there were more HD CCTV cameras shipped globally than standard definition analog cameras.

Among factors causing the shift in the market, IHS Markit points to the emergence of HD analog products that are attracting a new, lower-end market. Retail and commercial installations are now able to install small video surveillance systems more cost effectively while still benefiting from HD resolution.

Moreover, installing security contractors need not concentrate solely on small-market end users to leverage the latest advances in analog HD-over-coax technology. One of these technologies, 4K HDCVI, which was first brought to market by Dahua, can be positioned similarly to the benefits of IP 4K. Think casinos, banking and financial centers, among other deployments that require fine details but demand the requirement of retaining legacy infrastructure.

To better understand the opportunities that currently exist for deploying HD video over coaxial infrastructure, let's begin with some historical perspective about standard analog video and the continued technological advances that have ushered in ultra-high resolution imaging.

YOU'VE COME A LONG WAY, ANALOG

No matter the great strides achieved in video surveillance technology to date, there endures a certain ubiquitous reminder of the industry's humble beginnings: the relic, dust-covered analog security camera that remains mounted in settings of all sorts after years (and years) of service. No matter antiquated or not, these security devices stand testament to the high-quality video imaging that can be easily and affordably obtained on existing legacy infrastructure.

Analog systems rose to prominence with resolutions such as 480 TV lines (TVL), depending on the CCD/CMOS image sensor. The standard resolution technology would advance to 700 TVL, then 800 TVL. In time, industry pundits projected that 960H — H for horizontal, and 960 the amount of horizontal pixels in the video — would represent the last big advance in standard resolution analog technology. From there it was thought The Great IP Migration would eventually, for the most part, retire analog.

Of course, history has proven otherwise. The projected demise of analog hasn't been premature so much as it has been dead wrong. Analog remains a

Cable Type	Resolution	HDCVI	TVI	AHD
Coaxial Cable (RG6)	4K	700m	X	X
	4MP/3MP	700m	500m	300m
	1080p	800m	800m	500m
	720p	1200m	1200m	800m
Coaxial Cable (RG59)	4K	500m	X	X
	4MP/3MP	500m	300m	<300m
	1080p	500m	500m	300m
	720p	800m	800m	500m
UTP (CAT6)	4K	300m	X	X
	4MP/3MP	300m	<200m	<100m
	1080p	300m	<200m	<150m
	720p	450m	300m	200m

The comparison chart to the left lists transmission distances for HD analog security cameras of varying resolution — including 4K or Ultra High Definition (UHD) — that can be achieved on coaxial (RG-59, -6) and CAT6 unshielded twisted pair (UTP) cabling. Unlike competing HD-over-coax formats, 4K security video is possible with HDCVI technology.

highly viable technology that customers across multiple vertical markets are still using with much success toward their security and organizational needs.

With recent chipset advances, there are numerous benefits that analog video does still provide. Especially, there are certain markets that continue to demand analog infrastructure, yet require high resolution imaging. They want the best of both worlds: the easy plug-and-play of analog, but also the high definition that typical IP solutions were only able to provide at one time.

According to IHS Markit, there has been a rapid transition from standard definition analog cameras to high-definition CCTV cameras, particularly led by the formats High Definition Composite Video Interface (HDCVI), High Definition Transport Video Interface (HDTV) and Analog HD (AHD).

Video surveillance technology providers introduced these and other HD CCTV formats as a cost-effective means for upgrading low-resolution legacy installations to high definition imaging without the huge cash outlays common to many rip-and-replace IP deployments.

While these HD CCTV camera standards have inherent differences, they commonly start at 1080p or 2-megapixel resolution and increase from there. Today, true 4K HDCVI is a reality, but more on that later. Among the high points of HD CCTV, high resolution video can be sent over long distances without the use of repeaters or switches, compared to IP cameras that have shorter maximum cable runs (see sidebar on page 9). Furthermore, HD CCTV recorders can store feeds from HD analog, standard analog and network cameras on the same device, thereby increasing upgrade options and future-proofing existing systems.

Let's take a closer look at the three most prominent HD-over-coax formats:

HDCVI — HDCVI is an open platform standard developed by Dahua Technology with more than 200 global partners that utilize the technology.

- Analog HD signaling, Smart H.264+ compressed video
- Cable length varies by type
- Up to 800m with RG-59 coax @ 720p
- Up to 4K resolution (HDCVI 3.0)
- Simultaneously transmits four signals (audio, video, power and data) over a single coaxial cable. Dual-way data transmission allows HDCVI cameras to communicate with an HCVR to send control signals or to trigger alarms.

HDTVI — The HDTVI chipset was developed by Techpoint in 2014 and later sold to Intersil.

- Analog HD signaling, H.264+ compressed video
- Cable length varies by type
- Up to 800m with RG-59 coax
- Up to 5MP resolution with 4K video output (HD-TVI 3.0)
- Transmits video, audio and bidirectional data

AHD — AHD is owned by Nextchip, which develops the image signal processors and sells them to OEM video surveillance vendors. Nextchip released AHD, also based on an open standard, in 2014.

- Analog HD signaling, compressed video
- Cable length varies by manufacturer
- Up to 500m with RG-50 coax @ 720p
- AHDL: AHD 0.8, works with 960H AHD cameras and traditional analog cameras
- AHDH: AHD 3.0 includes up to 5MP cameras

In its Top Video Surveillance Trends for 2017, IHS Markit states that demand for HD CCTV cameras and recorders will continue growing rapidly. The research firm forecasts that in the professional market, shipments of HD CCTV cameras will grow to almost 29 million units globally in 2017. In fact, in several countries HD CCTV cameras are projected to account for the majority of cameras shipped in 2017.

Many of the initial barriers to adopting HD video over existing coaxial infrastructure have been resolved, according to IHS. For instance, HD CCTV equipment is available at attractive price points; it offers a much greater cable reach than early products; recorders are now available that can record in multiple formats; higher resolution cameras are being launched including 4K HDCVI.

4K HDCVI CAMERAS ARE WELL SUITED FOR SURVEILLANCE OF LARGE AREAS, CAPTURING VIDEO WITH WIDE-ANGLE OVERVIEWS AND MULTIPLE FOCUS POINTS WHILE MAINTAINING THE ABILITY TO DIGITALLY ZOOM IN AND FOCUS ON FINE DETAILS.



HD-over-coax technology transmits video uncompressed and without being encapsulated in TCP/IP. The result is a system in which a camera can be plugged into a receiving device and the video displayed without latency and free of configurations.

HOW HD-OVER-COAX STANDS UP TO IP

IP megapixel technology began to dominate the HD video surveillance conversation well over a decade ago. The technology provided end users increased image quality and a means to extend the operating distances of their systems. But that increase in quality came with a stiff price — measured in both dollars and, in some cases, technical challenges posed to security dealers and systems integrators.

Alternative methods to achieving high quality HD video surveillance emerged in the form of HD CCTV, as discussed above, that negated the need for networked cameras.

At a quick glance, one of the key differences between IP cameras and achieving HD-over-coax is obvious enough. One system requires Category-5e or -6 wires to transmit the packetized video information, whereas a HD-over-coax solution incorporates RG-59 or RG-6 cabling.

What are some of the other comparisons? First, IP networked cameras compress the video and then packetize it for transmission. HD-over-coax on the other hand is a point-to-point transmission of video using line-by-line serial data.

Because megapixel cameras transmit packetized video via TCP/IP, the number of images (due to processing power of the device) has been limited, especially as the megapixel quantity increases. By contrast, HD-over-coax technology transmits video uncompressed and without being encapsulated in TCP/IP. The result is a system in which a camera can be plugged into a receiving device and the video displayed without latency and free of configurations.

It's important to note, the quality of the coaxial infrastructure could be a major issue. Many legacy security applications, no surprise, may have been subject to cutting corners when it came to the coaxial cable specifications. Oftentimes, installed cable met some of the characteristics of RG-59 but not the requirements for CCTV-grade RG-59. This is referring to copper-covered steel center conductor with aluminum shield.

A 4K FORMAT EMERGES

The arrival of 4K security video has many advantages over both the current HD video and the older standard video formats. 4K offers four times the resolution as 1080p, providing end users vastly improved image quality to detect events and identify what happened during those events. However, there are drawbacks for installing security contractors to heed. For example, failure to sufficiently strategize and design the infrastructure and storage systems could significantly impact the solution's effectiveness.

As any attendee to the industry's largest exhibitions as of late can attest, there have been numerous 4K video cameras introduced to the market. In many cases, businesses are still adopting HD technology and making the leap to 4K at the same time.

Dahua Technology first hit the market with its HDCVI in 2012, with the capability of transmitting HD video via coax without latency over a distance of up to 500m. A second iteration of the standard would follow in 2014 that was featured in cameras and hybrid coax DVRs. Next in 2015, 1080p solutions geared toward entry-level applications became available.

Technological advances and market demand for ever-higher image resolution has delivered the next generation of video surveillance: 4K, or Ultra High Definition (UHD). Technically, most surveillance cameras utilize the ultra-high-definition television (UHDTV) standard, the 4K standard for television and computer monitors. UHD has twice the horizontal and vertical resolution of 1080p, a resolution of 3840 X 2160 (8.3MP), with an approximate 16:9 aspect ratio.

Adopting the latest technology, however, comes with a price. In addition to the cost of new solutions there is the investment in infrastructure — running new cable and purchasing back-end equipment — which can lower return on investment (ROI) in surveillance installations. One solution to boost total cost of ownership (TCO) is to leverage the infrastructure by using products that can easily replace existing hardware and that offer 4K resolution. Traditionally, obtaining higher-resolutions has been limited to IP systems, but an innovative new 4K over coax solution is changing the landscape of 4K video surveillance.

Higher resolutions require advanced equipment to transmit the video signal. Like most HD cameras, many 4K cameras are network cameras that require an existing IP infrastructure to transmit video signals. Using 4K technology to its full potential presents challenges for applications that are not equipped to transmit large amounts of data over an IP network or that have not yet upgraded to an IP-based surveillance system. Dahua has addressed this problem with the introduction of the first cameras that leverage coaxial cable to deliver 4K UHD video. Dahua's HDCVI 3.0 technology offers a series of 4K cameras that use coaxial cabling to transmit 4K UHD video signals. HDCVI technology integrates traditional analog surveillance systems with the latest 4K UHD cameras by simultaneously

High Definition Composite Video Interface (HDCVI 3.0) technology offers a series of 4K cameras that use coaxial cabling to transmit 4K UHD video signals. HDCVI technology integrates traditional analog surveillance systems with the latest 4K UHD cameras by simultaneously transmitting video and control signals over a single coaxial cable.

transmitting video, power and data signals over a single coaxial cable.

4K HDCVI cameras are well suited for surveillance of large areas, capturing video with wide-angle overviews and multiple focus points while maintaining the ability to digitally zoom in and focus on fine details. The plug-and-play approach enables 4K video surveillance without the need for configuring a network.

Following are the video transmission distances offered by HDCVI based on the type of coaxial cable and image resolution:

RG-59

- 720p: 800m (2,624.67 feet)
- 1080p: 500m (1,640.42 feet)
- 4K: 500m (1,640.42 feet)

RG-6

- 720p: 1,200m (3,937.01 feet)
- 1080p: 800m (2,624.67 feet)
- 4K: 700m (2,296.59 feet)

Cat-6 UTP (balun required)

- 720p: 450m (1,476.38 feet)
- 1080p: 300m (984.25 feet)
- 4K: 300m (984.25 feet)

Users previously hindered by the costs associated with upgrading cables and equipment can now realize unparalleled image resolution of 4K while maximizing existing infrastructure. Additionally, industries that require a hardwired system to ensure data security will benefit from a 4K over coax solution.

HDCVI 3.0 Shines in Demanding Warehouse Installation

Maintaining simplicity and cost efficiency without comprising high definition video imaging can be a tall order for an installing security contractor.

These same end-user demands would prove paramount in AA Security of Garden Grove, Calif., selecting an HDCVI 3.0 video surveillance solution for a challenging deployment across a sprawling series of small warehouses.

Like other HD-over-coax formats such as HDTV and AHD, HDCVI is especially well-suited for leveraging existing legacy infrastructure. Yet AA Security selected Dahua Technology's HDCVI 3.0 for the warehouse project, located in Anaheim, Calif., as part of a brand new installation.

LIKE OTHER HD-OVER-COAX FORMATS SUCH AS HDTV AND AHD, HDCVI IS ESPECIALLY WELL-SUITED FOR LEVERAGING EXISTING LEGACY INFRASTRUCTURE.

In a nutshell, AA Security Senior Technician Aaron McHargue explains the advantages of HDCVI 3.0 and why it was selected over an IP solution: "Cost savings, and you don't need a switch. You don't need to worry about changing IP addresses or network errors. You don't need to worry about any of that when you use the CVI format with the coax vs. IP."

The end customer — a cosmetics research and development firm — began with AA Security as a simple alarm account. Over time the business began to expand rapidly and AA Security was there to fulfill the owner's interest in video surveillance.

"We started installing cameras and as his business started growing he kept adding more and more [warehouse] suites. Now he is in his third building," McHargue explains.

That third building — which consists of a series of small commercial warehouses — has a footprint the length of a city block. The owner, a happy HDCVI customer from the prior camera deployments,

wanted to stick with it for the more expansive third building. So, McHargue and his team of technicians have run RG-59 for HD-over-coax cameras by Dahua Technology, some of which utilize wide dynamic range (WDR) and other enhanced feature sets.

McHargue is quick to emphasize a particularly useful trait of HDCVI 3.0 for this specific warehouse setting: extended cable runs.

"Having that extra distance we are able to go places where HDSI or other similar formats simply will not reach that far. That really helps," he says. "With HDCVI we are up and above 500 feet."

The ability to extend the cable run is especially useful, given that not every individual suite across the expanse of the building is owned by AA Security's customer. "Sometimes there is a suite in between that is owned by someone else, so we actually will go up through a vent, then go across the roof and bring it down in through another vent," McHargue says.

Beyond realizing installation efficiencies and cost-savings with HDCVI 3.0, an open standard that supports 4K over-coax resolution, McHargue says ease of use for the end user is a strong point during sales conversations. For instance, he describes a power-outage scenario.

"When you turn your DVR back on all your cameras come right back up. With IP that is not always the case," he says. "If you are new to IP — let's say you don't set your cameras to static IP — every time you boot up your cameras, even if it does find them again they will be in a different place every time."

What used to be camera No. 1 may now be No. 5; the camera order will become jumbled. HDCVI suffers no such dilemma.

"I am training two new people right now. For them it is so much easier just to say plug it into camera port No. 1 vs. needing to look up IP addresses. It really saves time," McHargue says. "Instead of looking up a series of IP addresses and guessing which ones go where, you just know this is the camera that's from the lobby area, and you want that to be No. 1 because that is where people first walk in."