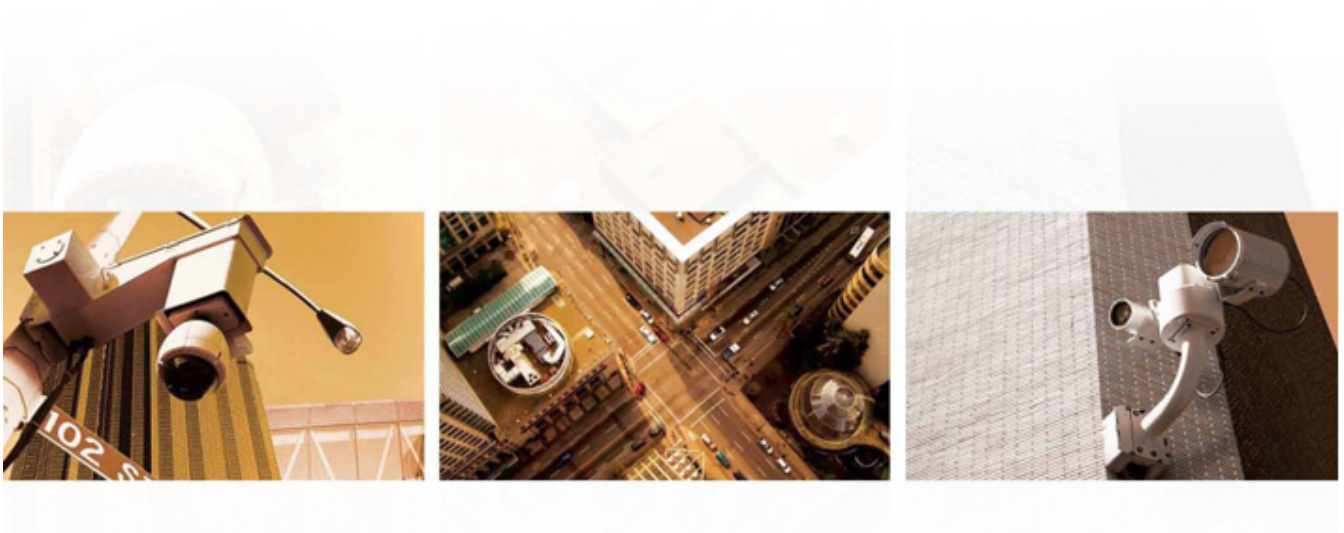


White Paper



PoE Power

The Secrets You Really Need to Know

While PoE has been a tremendous game changer in the camera surveillance market, there are technology considerations that beg the question – does PoE always make an installation easier?

The answer to this question is best examined as a case analysis.

Case 1: A client installs a security camera system. The client expects that by using PoE cameras they will simplify the installation and save cost. Two months after the installation, the client begins seeing cameras drop from the network. Five trouble calls to the site and 40 man-hours later, the problem is identified.

Case 2: A client wants to bid on a project calling for PoE cameras. The specification states that the maximum draw of the camera is seven watts with a heater. The client proposes 25-watt midspans to eliminate any chance of a power shortage. The client wins bid, and installs the proposed cameras and midspans. Two months later, cameras are dropping from the network. Countless conversations with the camera and mid-span manufacturers reveal no apparent discrepancy in the design bid. Two days into a troubleshooting visit to the site, the problem is identified.

What's the problem that both clients faced?

The Answer: **Power.**

Power-over-Ethernet (PoE) is perhaps the greatest invention to hit the security camera market since the migration to network cameras. Initially, network camera, also known as IP camera, growth was stymied by traditional security installers not fully understanding the new wiring architecture. They complained that IP cameras were not as effective at night; were more expensive; and most notably – were more expensive to install. Today's IP cameras, especially with the advent of improved CMOS chips, rivals the night clarity of some the most sensitive analog cameras. Price has significantly dropped due to new entrants in the market, and overall IP camera quality has improved. But it is the progress in ease-of-installation of IP cameras attributed to PoE technology that has bolstered their sales.

The secret to PoE is in the wire itself. Category 5 (CAT5) cable carries eight 24-gauge (AWG) copper wires which conduct both power and video signals to the camera. This is achieved by "twisting" and "pairing" the wires, which limits cross-talk and reduces power loss.

The other critical element to PoE is in the switch itself, which distributes video over the network, and acts as a power source for the cameras.

Coupled together, the wire properties of CAT5 cable and the efficiency of network switches make a compelling argument for network cabling versus traditional analog cabling architecture.

Evidence of this shift in the market is in the numbers. In 2007, IP cameras represented roughly 10% of the overall security camera market when compared to analog alternatives.

In 2008, that percentage doubled. In 2010, network camera manufacturers represented 65% of the overall camera security camera market. – *Source: IMS Research*

The demand for PoE enabled cameras has paced the skyrocketing demand in network cameras. On a recent client survey conducted by EdgeDweller of Security Industry Dealers and Distributors, all respondents identified "ease of setup and installation" as a primary consideration when selecting the type of camera to use for a project.

So if PoE enabled technology is a great thing, why haven't more dealers shifted from Analog to IP?

To answer the question, let's first review an analysis of the five major network camera manufacturers. **Figure 1 (below)** represents a comparison of the four common camera types and their respective power draws.

Figure 1

MANUFACTURER	BOX CAMERA	DOME CAMERA	INDOOR PTZ CAMERA	OUTDOOR PTZ CAMERA
 Arecont Vision megapixel technology... beyond imagination	 4.9W* AV2805	 15W AV5155	* DENOTES PoE CAMERA	
 AXIS COMMUNICATIONS	 5.5W* 221	 9.0W* 214	 14W P3346V	 74W Q6034-E
 Panasonic	 7.6W* WV-NP502	 7.6W* WV-NW502	 15W WV-NS954	 85W WV-NW964
 SAMSUNG	 8.0W* SNB 5000	 11W* SND 5080	 16W SNP 3370	 50W SNP 3430H
 SONY	 11.2W* SNCCH240	 7.6W* SNC DH280	 15W SNC RZ50N	 85W SNC RH164

The variation of power needs among the different camera types hints at the answer. While the basic IP camera draws less than 6 watts at peak operation, the chart shows that over 2/3rds of the most popular cameras fall well outside this spectrum.

In 2003, The Institute of Electrical & Electronic Engineers (IEEE) published a standard called the IEEE 802.3af standard. Switches and mid-spans which meet this standard provide 15 watts of power to the network. After line loss and in ideal conditions, this guarantees only 12 watts will reach the IP camera. So for most of the indoor box cameras shown in Figure 1, 12 watts is sufficient. But what about the others?

The security camera market is showing no signs of backing off its demand for power. An example of this is seen in the increase in demand for high-resolution video, one of several factors impacting the power needs of a camera.

As network storage and switch technology improves, the demand for high-resolution video increases. Evidence of this trend in high-resolution video goes back to 2006, when megapixel cameras were manufactured by only 1% of the camera surveillance market. In 2011, that number is closer to 60%. In addition, the average megapixel has leap-frogged from 1.3 megapixels to upwards of 5 megapixels, with some commercial camera manufacturers boasting upwards of 10 megapixels.

What's the end result? As camera processing capacity and resolution improves, so does camera compression. Today the buzz word is H.264, which has reduced camera file sizes by as much as 40% over previous technology. Tomorrow, it will be something else. Already rumors have been circulating about a Joint Collaborative Team (JCT) of The Moving Picture Experts Group (MPEG) and Video Coding Experts Group (VCEG) to establish a new standard known as High Performance Video Coding. This would be great except that all of this compression, resolution, and processing takes power; power that is still needed for the camera to operate in outdoor environments. If industry trends continue -- with more than one out of four cameras being hung outdoors (and the number is increasing) -- then power becomes a bigger issue. More power consumption by the camera leaves less power available for the heater and blower in outdoor enclosures.

What is the industry's response to this demand in power?

The Answer: Change the standard.

In 2009, IEEE created the 802.3at standard. The primary difference: Power. Instead of 15.4 watts at the power source, products meeting the "Type 2 AT standard" now deliver 32 watts, which translates to about 25 watts to the camera. Compliance with this standard, commonly referred to as "PoE Plus," has become more widespread in 2010. In 2011, look to see more products operate on an even higher-powered variation of PoE Plus called Ultra-High PoE, which utilizes all four pairs to transmit power. The benefit is that camera power requirements up to 60 watts can be supported. Ultra-High PoE requires the same powered pairs to carry data. Each pair acts as a DC circuit, with one wire transmitting power, and the other completing the DC circuit in common mode. This permits its use not only with [10BASE-T](#) and [100BASE-TX](#) networks, which use only two of the four pairs in the cable, but also with [1000BASE-T](#) (gigabit Ethernet), which uses all four pairs for data transmission. What does all of this mean? Today's Ethernet cables are carrying more power and more bandwidth, and more cameras are PoE capable.

While the AT standard has narrowed the gap between power supply and demand in the IP camera market, the benefits can be deceiving. In reality, the power demand is increasing faster than the supply. Even with 25.5 watts to the camera, Figure 1 illustrates the hurdles many current cameras have meeting this standard. And those on the border of 25.5 watts? Any surge due to a heater or blower kicking on in inclement weather creates the ideal environment for camera failure due to insufficient power. At anything close to the power threshold, beware -- as studies show the chances for a camera outage increases four-fold.

This is even worse considering network cameras operate like remotely positioned computers - meaning they do not automatically reboot and reconfigure when power is restored. And with complex Video-Management-Software (VMS) relying on video for alarm inputs, the implications can be disastrous. Couple this technological threat with the dealer who has to return to the job site to reboot and reconfigure cameras, and the proud advocates of all-things-PoE are forced to re-evaluate.

Let's revisit the clients in Case 1 & 2 mentioned earlier.

How will the industry address this power concern? Some camera housing manufacturers are building fail-safe mechanisms into their camera enclosure. This should come as no surprise to the traditional security market, which for years has built redundancy into camera installations by providing uninterruptable-power-supplies (UPS) at the camera head-end. Dealers will find that technologies which intelligently monitor power at the camera will provide a similar level of power protection. Dealers who sell PoE cameras should consider technologies that intelligently distribute power to the camera. In one such design, called Dynamic Power Allocation, a PC board directs power between the three major power users: the camera, the heater, and the blower. Much like a traffic cop, these intelligent enclosures ensure power is provided in the following priority: Camera first, then heater and blower. The purpose - keeping the camera's power needs top priority.

In addition, dealers will take solace in knowing that expensive trips to the job site to 'reboot cameras' can be eliminated if camera enclosures provide IP reset functionality. If used, these PoE enclosures reset the camera to a previously stored configuration and power condition, thereby eliminating the need to manually reset cameras in the field.

Techniques like the ones just mentioned will mitigate potential camera failures and are critical to surviving the ever-growing power struggle between the camera and PoE source. As media saturation of HD appliances continues to reach critical mass, there will be no shortage of innovation needed at the camera enclosure to ensure PoE solutions retain their cost-saving attributes.

About Moog Videolarm

Moog Videolarm is a leading designer and manufacturer of innovative physical security products including PoE Ready™ camera housings, wireless and vandal resistant camera systems, infrared illuminators, mounting poles, and other accessories. Various industries look to Moog Videolarm for surveillance solutions via an international network of partners. www.videolarm.com