

SECURITY SALES & INTEGRATION PARTNER SERIES



**HOW ADVANCING
TECHNOLOGIES ARE
BRINGING NEW LIFE
TO PTZ SOLUTIONS**





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Today's video technologies, including video analytics, megapixel imagers, and IP video network connectivity have sparked a renewed interest in the unique benefits of pan/tilt/zoom camera positioning systems.

Pan/tilt/zoom (PTZ) cameras and camera positioning systems have long been considered staples of the video security and surveillance industry. The first PTZ systems to hit the market decades ago were just standard CCTV cameras mounted on positional platforms. These first entries were slow and jerky in their movements. They weren't up to tracking moving objects, but were best used to simply reposition a camera for viewing different scenes. Over time, system agility improved, enclosures were incorporated and many special PTZ-specific capabilities were developed.

The golden age of PTZ systems peaked in the early 2000s with the integrated, high-speed, PTZ camera/dome positioning system. These integrated camera/dome systems represented the best in mechanical achievement with ultra-fast responsiveness, excellent optics, and the ability to respond to alarms, presets, tour programs and more.

Three models from Dahua's Ultra Series PTZ offering, which features the latest advances in integration, analytics, leading digital signal processing (DSP) and advanced image sensors.

And then the video-over-IP revolution began.

For all the strengths of the leading PTZ dome systems at the time, their weakness was that they were almost completely analog based. The high-performance domes of the day required hard-wire connections to transmit power, control and video. They were closed, proprietary systems that had evolved to be controlled by large, analog-based video matrix systems, usually from the same manufacturer as the dome.

In order to interface with evolving IP-based systems and video management system (VMS) control, a complex chain of analog to digital converters and protocol converters were required for any new PTZ installation. These extra conversion steps increased the cost and diminished the performance and reliability of the system.

A Visual Resurgence

In 2006, when multi-sensor cameras were introduced, their panoramic views and digital zoom capabilities offered attractive benefits for increased situational awareness, resulting in PTZ systems becoming less necessary. PTZ systems are best used in applications that require long-distance video surveillance with a live operator so details of a scene can be viewed closely.

While panoramic, multi-sensor images provide excellent video data for forensic efforts — to review events for missed details, movements and actions after the fact — a PTZ system provides real-time tracking of vehicles or suspects with focused detail, accurate color, and an appropriate level of zoom needed for effective clothing details, facial recognition, license plate recognition (LPR) and more.

The rule of thumb is that PTZs are used in manned applications, where an operator is sitting in front of a monitor, controlling the system. Choosing the right PTZ system depends on the security needs at hand. PTZ cameras are designed for an entirely different purpose than fixed stationary cameras. And with the new generation of PTZ systems, their true strength may be found when used in combination with other video technologies and imaging systems.

The Analytics Breakthrough

As IP video networks have evolved, so have PTZ systems. The PTZ systems of today are smaller, lighter and smarter than their predecessors. By reducing system weight through the use of more deeply integrated mechanical components, higher-resolution imagers and overall miniaturization, PTZ systems are now able to be deployed on networks and take advantage of IP connectivity benefits. These advantages include VMS system control integration, shared network resources, simple single-network-cable installation, and in many cases even power over Ethernet (PoE) connectivity.

One particular area of integration that has bolstered the popularity of PTZ

systems is video analytics. By utilizing video analytic behaviors with positional camera systems, operators can greatly extend the usefulness of the PTZ system. With analytics, the system is able to autonomously track objects the operator may not have noticed or when the operator is away from the controls. This integration with video analytic behaviors perfectly enhances the effectiveness of PTZ systems.

There are a number of video analytic behaviors available with today's leading PTZ systems, including:

- Tripwire behaviors that can activate a camera (or trigger alarms and other operations) when a person or object moves into a restricted area.
- Directional behaviors notify operators or activate cameras when someone or something moves against the designated flow of traffic, such as someone trying to walk into an exit path.
- With an abandoned object behavior, the video system can tell when an object — such as a backpack, box or briefcase — is set down and left unattended.
- License plate recognition, facial detection, perimeter detection and more are all features in an ever-growing list of very useful video analytic tools.

But for PTZ systems, auto-tracking is one of the most valuable features. Auto-tracking controls the PTZ actions of a camera to automatically track an object in motion and to keep it in the scene. The tracking action can be triggered manually or automatically by defined rules.

Once a rule is triggered, the camera can zoom in and track the defined target automatically. This analytic behavior takes advantage of the unique capabilities of a PTZ system, and becomes a force multiplier for the operator.

Another good example of this level of integration is with camera systems that incorporate both a 360°, panoramic, multi-sensor camera with an optical PTZ camera. In this application, the imaging systems work in concert with the panoramic camera, watching everything at once and looking for moving objects. When an exception is detected, the PTZ camera is activated to track the movement or exception in question.

This level of integration greatly extends the intelligence at the edge devices and allows users to gain much more value from their positional systems.

A Note on Compression

Advanced video compression is yet another technology that has allowed PTZ cameras to regain their place in deployments. The latest compression standard, H.265, allows for much higher compression ratios with less bandwidth and storage requirements than previous algorithms, which opens the door for higher resolution imagers and deeper systems integration.

FROM CASINOS,
MALLS, AIRPORTS
AND STADIUMS TO
TRAFFIC MONITORING,
BORDER PATROL, CITY
SURVEILLANCE, CRITICAL
INFRASTRUCTURE
AND HOMELAND
SECURITY OPERATIONS,
P/T/Z SYSTEMS
ALLOW OPERATORS
TO EFFICIENTLY AND
EFFECTIVELY COVER
LARGE AREAS WITH A
SINGLE CAMERA.

Smart H.265+, for example, is an optimized implementation of the H.265 codec that uses a scene-adaptive encoding strategy, dynamic GOP, dynamic ROI, flexible multi-frame reference structure and intelligent noise reduction to deliver high-quality video without straining the network. Smart H.265+ technology reduces bit rate and storage requirements by up to 30% when compared to standard H.265 video compression.

High Definition Video Over Coax

Another connectivity option available for PTZ systems is that of transporting high-definition video over coax. This option allows legacy coax systems to be easily upgraded to HD video using existing analog infrastructure for clear, high-resolution images. With HD video over coax, there is no latency in system responsiveness, and no video compression, so the images maintain a very high level of detail and aren't stretched or distorted. Because the coaxial cable allows for bidirectional data transfer, a separate cable is not needed to control the PTZ mechanism.

HD video over coax is a secure data transmission method, and no network experience is required for installation. The format's plug-and-play level of simplicity decreases installation time. An excellent option for medium- and long-distance installations, HD video and control over coax may be a viable upgrade or affordable, alternative connectivity option where an IP network isn't required.

Right Choice for Harsh Environments

Most leading manufacturers offer a range of PTZ dome systems for outdoor and environmental use. The model types include sealed, pressurized systems that protect the optics from water, marine salt, smoke, dust and the finest of particulates. There are also hyper-sealed, stainless-steel "explosion-proof" dome systems designed to assure the dome itself is never the source of ignition within explosive and gaseous environments, such as the petroleum industry and many industrial applications.

Pulling together the latest advances in integration, analytics and physical and environmental concerns, the Ultra Series PTZ cameras from Dahua, for example, brings together leading digital signal processing (DSP) and an advanced image sensor, which offers excellent image performance for different environmental applications.

The series supports Ultra-High Definition images up to 4K resolution, large optical zoom up to 40x, true wide dynamic range (WDR), powerful, long-range PTZ performance, integrated IR illumination, and more. This series also supports face detection analytics, heat map capabilities and auto-tracking. The series has been designed with city and perimeter surveillance applications in

mind, and is fully protected from dust and water, certified to IP67 and vandal resistant to the IK10 standard.

IR and Zoom Priority

An advancing feature of leading PTZ dome systems is the integration of infrared (IR) illumination into the PTZ itself. This new approach to IR illumination allows the infrared light to be applied only where needed. Some dome systems have an array of three distinct areas of infrared illuminators, each with a different angle of dispersion for the IR light: wide angle, telephoto and an interim angle.

As the operator optically zooms in from wide angle to telephoto, IR illuminator LEDs will turn on and off to provide effective illumination. Additionally, when the camera is zoomed all the way into a scene, the system is not flooding an entire 120° view with infrared illumination. The system simply adjusts to illuminate just the area in view, reducing the amount of power load required.

Dome systems that utilize an IR zoom priority feature are particularly effective in applications where vast outdoor scenes must be monitored.

Additionally, laser IR systems adjust the dispersion angle based on the depth of the optical zoom. With a wide angle zoom, a lens within the IR system spreads out the infrared light to illuminate the appropriate wide area. As the zoom depth changes, the angle of the IR illumination changes dynamically with the optical zoom.

Zoom Factor and Resolution

When researching and specifying a PTZ system, keep in mind that a higher zoom factor does not necessarily equate to a better video image. An 18x zoom can be equal to a 36x if the 18x has a higher resolution imager.

The zoom factor refers to the ratio between the lens' longest and shortest focal length. For instance, a lens that has a 1mm to 26mm focal length and one that has a 10mm to 260mm focal length are both 26x lenses, but with completely different performance. The focal length of the lens will provide a better indication of what is appropriate for an application vs. comparing the zoom factor.

Not All Lower Domes Are Alike

Many manufacturers use a plastic lower globe to protect the camera and optics. Unfortunately, plastic introduces many limitations for increased optic resolution because a plastic lower globe is extremely difficult to manufacture with a high degree of optical clarity.

A plastic lower globe may look optically clear and free of anomalies, but as the camera pans up toward the horizon, the camera begins to view through

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the globe in the areas where it has the least uniformity. This lack of uniformity is where most optical distortions can occur.

Some manufacturers are making use of glass lower globes, which are more optically pure and consistent than plastic globes. Some companies offer PTZ products that use a flat piece of glass to protect the optics, instead of a globe. Clear, consistent, optical-quality glass coverings allow dome systems to feature higher resolution sensors and longer optical zooms.

Additionally, some dome systems provide a modified lower dome design that allows for above-the-horizon viewing. This is an excellent feature when trying to monitor rough terrain or scenes on different planes of view. Consider situations such as with a PTZ dome installation under a bridge, this extra 15° of tilt range above the horizon could allow for viewing up toward an adjacent off ramp.

Almost Limitless Uses

The preferred choice for monitoring and securing large areas — both indoors and out — are high-quality PTZ camera positioning systems. These systems can be found within an almost limitless variety of situations where clear, accurate, and responsive video surveillance is needed. From casinos, malls, airports and stadiums to traffic monitoring, border patrol, city surveillance, critical infrastructure and homeland security operations, PTZ systems allow operators to efficiently and effectively cover large areas with a single camera.

And now with the integration of video analytic capabilities, IR illumination, WDR, low-light imagers and digital networks, PTZ systems have found a new surge in popularity during the past few years. These new technologies have greatly improved the effectiveness and usability of PTZ systems, earning them a new position of favor among video security and surveillance professionals.