

# IP Networking and Its Impact on Video Surveillance

## Introduction

Video surveillance is critical for business. Different organizations use video surveillance to protect people's safety, protect valuable assets, or minimize risks associated with criminal activity.

In the past, only larger companies could afford IP video surveillance. Now, the proliferation of IP networks and falling prices on IP video cameras are making these solutions an attractive option for many industry sectors, including retail shops, educational institutions, governments, and any business requiring security surveillance.

One of the biggest trends in surveillance is the accelerating shift to IP from analog. With about 15 million surveillance cameras installed in the United States today, almost 10 percent are now IP based.

## The Evolution of Video Surveillance Systems

Video surveillance, or CCTV (closed-circuit television), is a 30-year old industry that has seen its share of technological changes. Recently, the ever-lower cost of IP bandwidth and storage has made video capture and storage over IP networks faster, simpler, and more affordable. Now, markets such as K-12 schools, public libraries, hotels, and small factories or plants can implement comprehensive video surveillance. This next section explores the evolution of video surveillance systems as they move from strictly analog, to a hybrid of analog and digital, to digital networks.

### Analog CCTV Systems

For the past 20 years, most monitoring and surveillance applications have used analog technology. Videocassette recorders (VCRs) recorded feeds from analog cameras (see Figure 1). The solution boasted a manageable price point and reasonable ease of use. However, analog systems are not without shortcomings. Analog CCTV systems generally offer no remote accessibility and are notoriously difficult to integrate with other systems. Analog systems are labor intensive, since operators need to change tapes often and perform system maintenance. Tape wear and tear is an ever-present problem. Recorded images are low-resolution, and often not sufficient for official investigations.

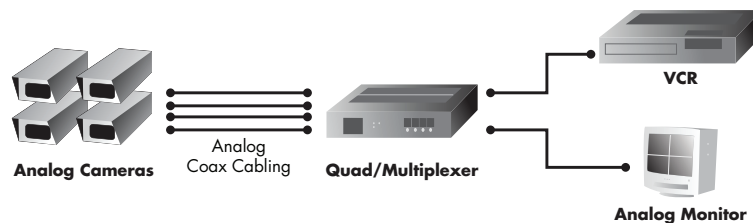


Figure 1: Analog CCTV System

### Analog Cameras with Video Server on an IP Network

The introduction of digital video recorders (DVRs) improved upon a strictly analog system. A video server connects existing cameras to the IP network, and the video is stored on an IP network server (see Figure 2). This solution eliminates the issues created by degrading tape quality and the need to change tapes constantly.

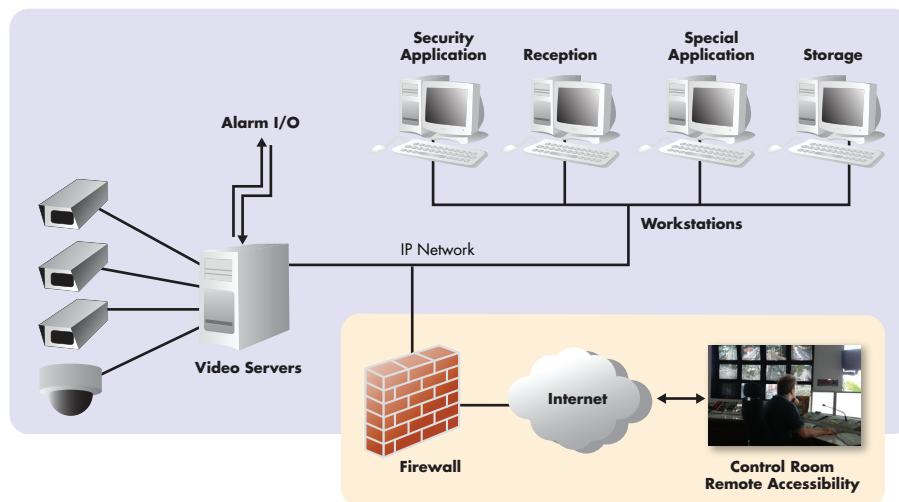


Figure 2: Upgrade: The ongoing digital revolution

This solution introduces many advantages:

- Remotely access video feeds, eliminating the need for dedicated security monitors in a central office
- Secure, password-protected access anywhere there is an Internet connection
- Remotely control cameras and other aspects of the surveillance system
- Easily integrates with other systems and applications
- Lower TCO (total cost of ownership) by leveraging existing IP network infrastructure and legacy cameras

### Network Camera-based Video Systems

The next step that completes the migration to a complete IP-based surveillance solution is the introduction of network cameras (IP cameras). Companies can connect as many IP cameras as needed directly to the IP network (see Figure 3). This provides a new set of added benefits:

- Flexible video access options, from restricted to authorized to public
- Supports both local or remote access
- Cameras install easily and affordably to the existing IP network
- Eliminates the need for expensive coaxial cabling to cameras
- Viewing footage requires only a computer and a web browser or dedicated software
- Shares a unified communications network with data, voice, and wireless traffic, reducing operations and maintenance costs

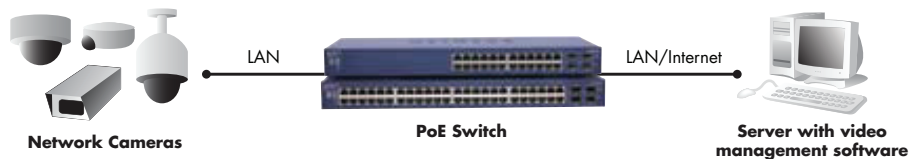


Figure 3: Network camera-based video surveillance architecture

## The Benefits of IP Networks for Video Surveillance

Let's take a deeper look at the inherent benefits of IP networks for video surveillance systems.

### Reliable and Easy to Manage

One key advantage of using IP networks for surveillance is their ability to protect the integrity and availability of recorded surveillance video and images. IP networks integrate many features that prevent data loss, back up mission-critical data, and recover quickly from outages. A network management system can monitor all networked devices—including cameras, switches, access points, and storage devices—and automatically generate alerts or notifications if issues are detected. For example, if an IP camera goes offline, a network management system can immediately alert administrators, who can then—from wherever they are—reassign another camera to cover that area. If a storage unit is unavailable, the back-up storage can automatically take over and no recorded data is lost.

### Flexible Camera Deployment

Analog cameras are limited in their deployment options, since they must connect directly to a DVR via a cable. In contrast, IP network cameras can be deployed anywhere reachable by Ethernet cabling or a wireless access point, expanding deployment options to include longer reaches or even outdoor coverage.

Power over Ethernet (PoE), a feature unavailable in analog video systems, simplifies installation of network cameras/video encoders, reduces installation and maintenance costs, and improves reliability in IP video surveillance systems. PoE enables IP network devices to receive power from a PoE-enabled switch or mid-span through the same standard cable that transmits IP data. You do not need to hire a certified electrician to install separate power lines—a big advantage for network cameras, particularly in difficult-to-reach areas.

It is important to determine the type of camera each surveillance area needs, as different cameras have different power requirements. The PoE standard supports 15.4W, sufficient for most common network cameras. However, a pan-tilt-zoom (PTZ) camera, which detects motion, turns, and zooms in towards movement, requires 20-30W of power to operate. PTZ cameras need the support of PoE Plus, a new standard which provides up to 30W of power. Many of the latest switches support PoE Plus.

IP networks also make it easier to adjust surveillance coverage when needed. You can add, move, or remove cameras without taking other cameras or equipment offline. This simplicity and flexibility further ensures there are no gaps in your recording.

## Minimize Installation Expense and Network Disruption

Even in cases where large amounts of video traffic require additional IP network capacity, pure IP surveillance systems are less disruptive to install than their analog counterparts are. Unlike analog systems, which require coaxial, Fiber, or unshielded twisted pair (UTP) cabling from every camera to a DVR, IP-based cameras leverage existing Ethernet ports. Some IP cameras can receive power via an Ethernet connection, avoiding expensive and disruptive site modifications to bring power lines to camera locations.

## Moving to IP Video Surveillance

Building an IP surveillance system can be simple and cost-effective. However, there are some technical requirements to consider when installing an IP surveillance system, or transitioning from an existing analog system to a high-functioning IP surveillance system. Considerations include network bandwidth and latency, network features and capacity, wired or wireless, hard disk storage capacity, and application software.

There are many ways to design, deploy, secure, and optimize a network for IP surveillance. Network switches make it easy to increase the bandwidth capacity of a network simply by adding switches/routers. Some switch technologies can also optimize bandwidth usage. Here are some features to consider for cameras, network switches and storage that help make IP surveillance systems flexible, resilient, easy to deploy, and convenient to manage.

## Storage Requirements

Video requires a lot of storage. A small surveillance system of five basic IP cameras recording continuously for a week consumes over one Terabyte (TB) of storage. Larger deployments of 30 high-resolution cameras using even the latest compression techniques still consume 2TB per week. Fortunately, as the cost per gigabyte of storage drops, it is becoming very affordable to store large amounts of video. There are solutions that increase storage space while protecting data. Built-in redundancy features and automatic backups to remote locations greatly reduce the risk of data being lost.

## Wireless

A network camera with wireless support is attractive when running a cable between a LAN and a network camera is impractical, difficult, or expensive. Wireless network cameras are suitable for use outdoors, in historic buildings where the installation of cables would damage the interior, or in cases where there is a need to move cameras to new locations on a regular basis, such as in a supermarket. Ensure that the wireless network camera supports security protocols such as IEEE 802.1X and WPA/WPA2 (Wi-Fi Protected Access), which will help secure wireless communication.

## Security

A video surveillance network camera should provide different levels of password-protected access. For instance, some authorized users may only have access to view images from specific cameras; others have operator-level access, and a few have access to administer all settings in a network camera. Beyond multi-level password protection, a network camera may offer AES encryption to secure video streams; IP address filtering, which gives or denies access rights to defined IP addresses; IEEE 802.1X to control network access; and user access logs.

## Network Management

During network congestion periods, Quality of Service (QoS) capabilities in network switches prioritize and reserve network capacity for mission-critical video. Assigning a high priority to video traffic guarantees its timely delivery.

Logically separating different types of traffic on a network is another way to optimize video delivery and increase network security. Virtual LANs (VLANs) divide an IP network into different logical segments. You can use a VLAN to separate video traffic from other data such as IP phones and business applications. Video traffic that is on its own VLAN is easy to manage and prioritize.

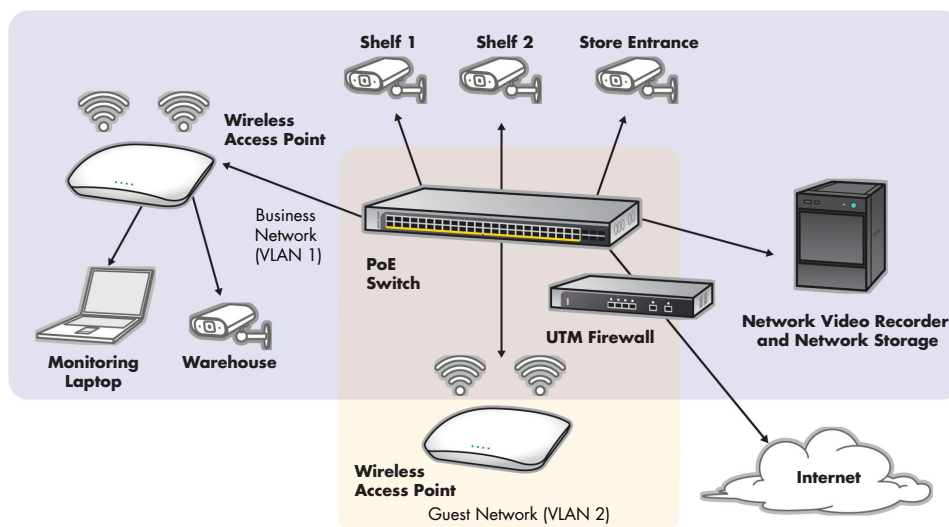


Figure 4: A network camera-based unified IP network

## Hot Markets for Digital Video Surveillance

Commercial businesses represent the bulk of the video surveillance market, but video surveillance use in other segments is growing. Retail organizations are introducing IP video surveillance as a way to protect their stores and goods from thieves or vandalism. They are installing IP cameras at store entrances, in shelving aisles, and cashier points. Car dealerships are a good example of the perfect environment for IP video surveillance, with millions of dollars of inventory in outdoor lots susceptible to theft or extreme weather. Operators can monitor cameras from their office or from any location via an Internet connection.

Hospitals are another popular market for IP video surveillance. Hospitals use surveillance to protect the safety and security of patients and staff, improve staff productivity, and monitor critical areas for theft.

### Summary

As a result of the many benefits of IP video surveillance including lower TCO, ease of deployment, and remote access, more and more businesses are adopting video surveillance. Organizations who used analog-based CCTV systems in the past are now migrating to complete network-based digital systems. Businesses who could not afford dedicated video surveillance rooms and expensive equipment can now deploy IP cameras for a fraction of the cost of traditional systems and enjoy the extra security and peace of mind that video surveillance brings.

## NETGEAR ReadyNAS Surveillance for Sophisticated Network Video Recording

Small businesses and corporate branch offices require a secure way to protect physical assets, but may lack deep security expertise or a big budget. NETGEAR combines market leading storage and switching solutions together with sophisticated network video recording (NVR) software to provide a powerful solution that is easy to install and manage.

A user-friendly NVR system should combine fast and flexible configuration with easy operation. With a few simple steps for installation, the web-based management leads users to configure, monitor and playback video everywhere. UPnP search, auto camera detection and GUI schedule save setting-up time, while the easy drag and drop camera, auto scan, preset point patrolling, and multiple views offer users a prime monitoring experience.

## NETGEAR ProSafe PoE Smart Switches for Growing Business Requirements

NETGEAR ProSafe PoE Smart Switches are designed for business networks, providing high performance, network intelligence, and reliability without adding complexity or huge costs. With enhanced traffic management, ProSafe Smart Switches efficiently deliver business-critical traffic like streamed video, even when the network is congested. You can add more switch capacity without taking switches offline, and PoE support makes it simple to install IP network cameras in areas without power outlets. NETGEAR Stackable PoE Gigabit Smart Switches provide up to 30W of power based on PoE Plus standards—enough to power high-end PTZ cameras.

With NETGEAR PoE Smart Switches, organizations can simplify ordering, design, and implementation. All Smart Switches come with high availability and “smart” management features that maximize uptime while making it easy to configure, monitor, and troubleshoot.

Video surveillance deployment is even easier with the new Auto Video VLAN feature. With Auto Video VLAN, operators select a Video VLAN with assigned priority and security configuration, and then plug the network cameras in to the network. The ProSafe Smart Switch automatically detects the cameras and assigns them to the pre-defined VLAN. In one simple step, your video surveillance system is ready to go.

System integrators manage tens of thousands of cameras worldwide with NETGEAR smart switches. They chose NETGEAR because of performance, value, and reliability advantages. Using NETGEAR helps integrators pass along compelling value to their customers while providing state-of-the-art equipment and field-tested success.

## NETGEAR ReadyNAS for Easy Digital Video Storage

Even compressed video needs a lot of storage. NETGEAR ReadyNAS Advanced Network Storage solutions provide reliable, high-performance network-attached storage for business-critical applications like IP surveillance. ReadyNAS makes it easy to add capacity with zero downtime to serve growing storage requirements, while making it simple for authorized users to access data no matter where they are. ReadyNAS protects information by combining multiple hardware fault-tolerant features with software features like online backups and secure offsite replication.

## NETGEAR ProSafe® Wireless Access Points and Controllers for Reliable Video Over Wireless

NETGEAR ProSafe offers a range of wireless access points (APs) and controllers that deliver advanced speed and range combined with comprehensive security. PoE support in the wireless APs, combined with an easy-to-use graphical user interface, make installation quick and easy.

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