Quantum Automation TECH CORNER
with Nirzari Parikh

Industrial IP Cameras

Wireless technology is used just about everywhere now and video surveillance takes noble advantage of that. A wireless camera has a built-in RF transmitter to send video over the air to the receiver instead of transmitting through wired connection. The receiver could be connected to a monitoring or recording device. Some receivers have built-in storage capacity, while others must be connected to a NVR (Network Video Recorder). An IP camera sends and receives data over a local area network (LAN) and/or internet. This gives the camera the potential to be viewed from anywhere in the network of the camera.

Why use IP camera?

IP cameras can perform all the tasks that a traditional analog video system can do, from security surveillance to quality assurance, but with added benefit of remote viewing. They can use the existing internet access within the building and therefore they don't require additional installation of coaxial cables throughout a building. Because IP cameras transmit over the internet, you just need your PC vs. purchasing additional monitoring equipment. Also, there is no limit to the number of cameras that can be installed in a network as long as there is sufficient bandwidth to support them.

Moxa VPort 36-1MP   Moxa VPort P06-1MP-M12

How does an IP camera work?

Instead of transmitting video over a video cable to a monitor or DVR, an IP camera transmits digital signals of the video over a data connection like Ethernet or WiFi. A radio transmitter is built-in to the camera unit as mentioned before. The camera is connected directly to the network just like any other network device like printers and scanners. It depends on type of camera as to saving the video. There are a few options: the camera may save the video to attached memory like a SD card, connect to another device on the same network to store the video, or stream the video on the internet.

How does IP camera connect to the network?

There are few options for networking in security surveillance applications:

- Wired networks can be connected to a router or a managed switch through Ethernet cables (10/100/1000 BaseT using an RJ45 connector on CAT5e or CAT6 cable; or fiber optic cable with either an SC or ST connector. Note: 1000 BaseT = 1000 Mbps). Because wired networks are the fastest and the most secure method of connection, it is the preferred method for connecting IP cameras in industrial environments.

- Wireless networks can use a WiFi router to transmit data to and from a wired modem. The rate of data transmission is not much slower than that of wired networks and uses 64-bit and 128-bit WEP encryption security. The Moxa AWK-3131 industrial IEEE 802.11 a/b/g/n wireless AP/bridge/client transmits up to 300 Mbps using 802.11n wireless standard.

- Cellular network access is the slowest one but very secure. The cameras have built in cellular transmitter and they don't require LAN. This option can be quite expensive when transmitting high quality videos because of the additional cost of using cellular data. You can easily use up a 1GB data plan in 1 day, so an option may be to send MJPEG Images to an FTP site, then integrate into an HTML dashboard. Our suggestion is to get the 5GB AT&T data plan that Quantum Automation offers.

Moxa AWK-3131 (WiFi router)
Industrial IEEE 802.11 a/b/g/n
wireless AP/bridge/client

Moxa OnCell G3150-HSPA (Cellular router)
Industrial 3G+ five-band HSPA high speed
IP gateway with VPN

How does an IP camera collect images?

An IP camera captures the images and video the same way your digital camera does. The difference is the ability to compress the files (H.264 format) and transmit them over a network. If there is a need to install multiple IP cameras, a Network Video Recorder (NVR) is required. A NVR can store videos from network cameras and it allows for viewing multiple cameras at once. It is similar to a DVR except that it depends on the camera to encode the video.

Note: H.264/MPEG-4 Part 10 or AVC (Advanced Video Coding) is a standard for video compression, and is currently one of the most commonly used formats for the recording, compression, and distribution of high definition video.

Moxa VPort 16-M12

Moxa VPort 26

What is required to use an IP camera?

Computer – to configure your camera (Set IP address, Field of View, Resolution, Color or B/W etc.)
NVR – for storing the video and allowing multiple video viewing on a video monitor
Managed Ethernet Switch or Power over Ethernet (PoE) Switch – to manage multiple cameras in the network
Power Supply – usually 24 VDC
In addition to above, you will need internet service, wired or wireless router depending on the camera and a static IP address (or DNNS) for the camera.

Moxa MxNVR-IA8 - 8 channel industrial network video recorder

Moxa SoftNVR - 64 channel IP video surveillance software for industrial automation systems

How to power the IP camera?

There are few options to supply power to the IP camera. You can choose from a battery operated camera, PoE (Power over Ethernet) camera, or have it connected to the wall socket with an adapter.

What are the applications of an Industrial IP camera?

The IP camera systems have diverse applications for security surveillance in almost everywhere and few of them are mentioned here.

- Machine monitoring
  To check on machine performance, operating conditions of the machine, and monitor the safety of the operator
- Retail shopping centers
  Monitor or record live videos of business premises, catch dishonest employees, protection of the inventory, detect unwanted activity outside office hours.
- Education
  Monitor the safety at school, conduct remote classroom sessions
- Construction industry
  Monitor safety at the site, protection from threat and overlook the site activities
- Factory/Warehouse/Loading Racks
  They typically have large area and it is good to have security surveillance system to monitor and avoid vandal activities in the building and protect the inventory. It is also used to monitor that the proper parts are being loaded onto the trucks.
- Medical facility
  Maintain the safety and security in large hospitals

**How to set up IP cameras?**

- Set up a single camera:
  The following arrangement shows the set up for a single camera.
  The camera turns video and audio into data.
  - The camera connects to the network via a Network switch or router and transmits the data on the network.
  - This data can be viewed as high quality images/video with audio on any authorized PC or mobile phone over the local network or internet.
  - The NVR can be used to record and view images from multiple cameras on the network.
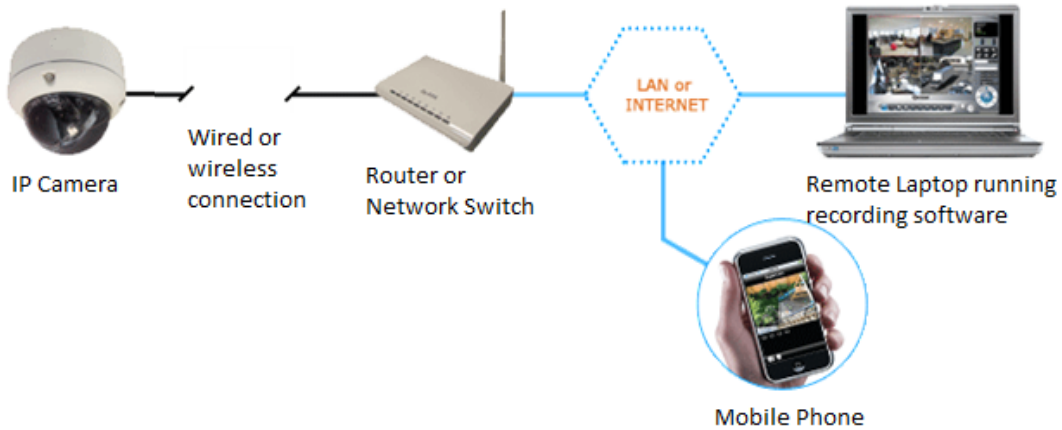
- Set up more than one camera:
  The following arrangement shows the set up for more than one camera.
    - The camera turns video and audio into data.
    - The camera connects to the network via a Network switch and then to the router to transmit the data on the network.
    - This data can be viewed by authorized PC or mobile phone over the local network or internet.
   - NVR can be used to record and view images from multiple cameras on the network.
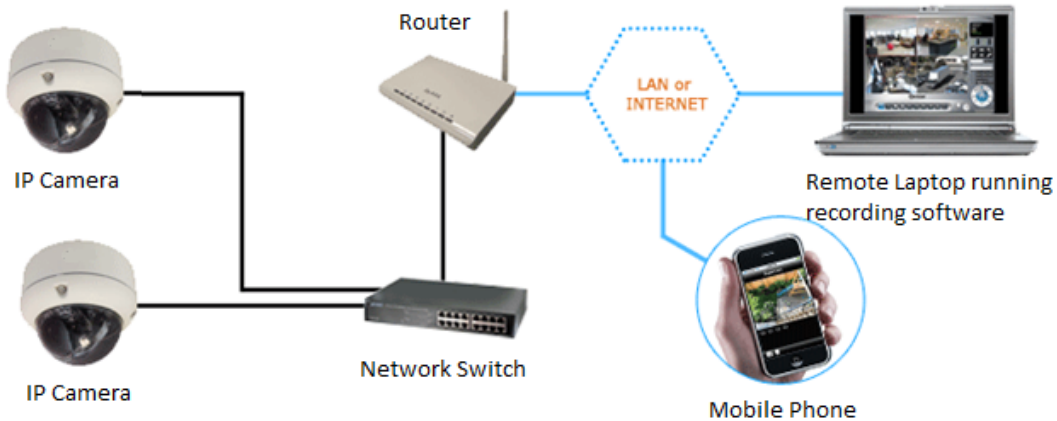
- Set up multiple cameras over multiple sites:
  The following arrangement shows the set up for multiple cameras over multiple sites.
    - In the figure shown below, each site has 2 IP cameras.
    - At site 1, cameras are connected to the local network for live viewing of the videos and they are also connected to the internet via router.
    - At site 2, there is no local viewing required, so the cameras are directly connected to the internet.

- At the Network Operating Center (NOC), all the cameras can be viewed and recorded at the same time on a PC, laptop or a mobile device.
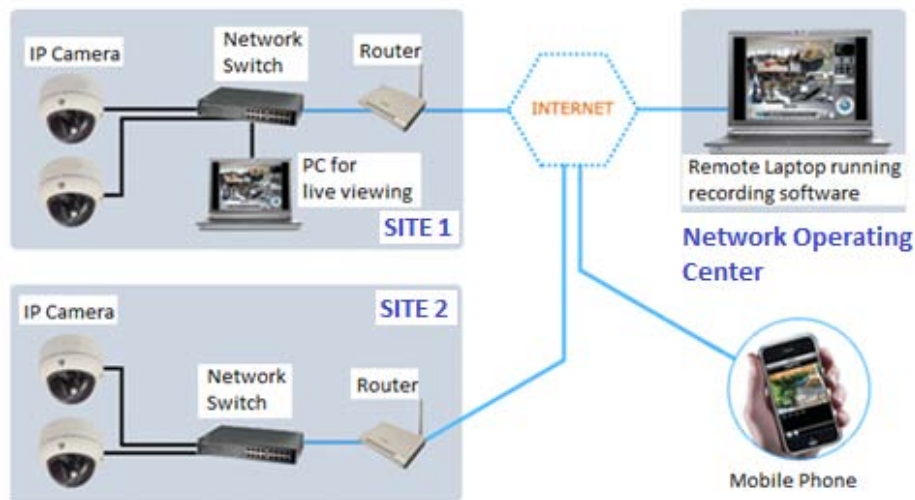
Factors to consider before choosing the IP camera:
- Protection rating according to where the camera is to be installed
- What type of mounting accessory is required
- Lens with Day/Night recording capability
- Video resolution and FPS (Frames per Second) requirements for the desired application
- What formats are supported for video streaming (H.264, MJPEG)
- Power requirements (PoE, 12/24 VDC, 24 VAC)
- Operating temperature requirements
- What alarming features are required from the camera
- What network protocols are supported by the camera
- Local storage requirements