

IP Camera Tutorial

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What is an IP Camera?

IP camera is a combination of a camera and a computer. The camera can be connected directly to the network. It has built-in software for a web server, FTP server and e-mail client. Some advanced versions support motion detection and alarm input/output ports.



Difference between IP and CCTV Camera

- Analog CCTV systems connect to a DVR (digital video recorder) using coax cables and BNC connectors (not networked).
- IP Cameras connect directly to an existing Ethernet network. This connection could be wired or wireless and they can be accessed from anywhere.



Difference between IP and WEB Cameras

- WEB cameras must be plugged to a computer to be used (USB connection). They have to use the resources of the computer they're connected to.
- IP cameras are independent networking devices that can be shared and accessed from anywhere.



How does an IP Camera work?

- The Camera captures the image
- Captured images are transformed into electrical signals
- These signals are converted from analog to digital format
- Digitized signals are compressed and sent over the network



Image resolution

- Digital image resolution is measured in Pixels (640 x 480, 320 x 240)
- The more detailed an image, the more pixels and the larger the file size
- Detailed images require more space on a hard disk and more bandwidth for transmission



Image Compression

- For storing and transmitting images over the network, they must be compressed or they will consume too much disk space or bandwidth
- M-JPEG and MPEG4 are the common standards used for image compression in IP Cameras



M-JPEG vs. MPEG4

M-JPEG

- Less compression
- Better image quality
- Larger images and video files
- More bandwidth required
- More storage space

MPEG-4

- More compression
- Lower resolution
- Reduces amount of storage needed
- Reduces bandwidth utilization by camera
- Allows more video to store



IP Camera Image storage, bandwidth and Resolution chart

Camera stream	MJPEG	MJPEG	MJPEG	MJPEG	MPEG4	MPEG4	MPEG4	MPEG4
Resolution	320 x 240	320 x 240	640 x 480	640 x 480	320 x 240	320 x 240	640 x 480	640 x 480
Compression	High	High	High	High	High	High	High	High
Average Frame size	~ 8KB	~ 8KB	~ 23KB	~ 23KB	~ 0.8KB	~ 0.8KB	2.3KB	2.3KB
# of cameras	1	1	1	1	1	1	1	1
Frame rate/ second	10	30	10	30	10	30	10	30
One day of storage size	6.91GB	20.7GB	19.87GB	59.62GB	0.69GB	2.07GB	1.99GB	5.96GB
Bandwidth per camera	640Kbps	1.92Mbps	1.84Mbps	5.52Mbps	64Kbps	192Kbps	184Kbps	552kbps

The chart shows that resolution, compression, frame rate and the number of cameras on the network are factors to be considered for IP Camera deployment specially for storage and bandwidth usage.



Lens Questions

What are CCD and CMOS cameras?

Charge Coupled Device (CCD) and Complementary Metal Oxide Semiconductor (CMOS) are the components in a camera that act as the camera's "digital film" and are responsible for resolution and overall quality of the picture. CCD cameras have better light sensitivity, sharper images and enhanced colors and are more expensive than CMOS cameras.



Lens Questions

What is the f number?

f# is the ratio of the lens focal length to it's diameter

What is the focal length?

Focal length indicates how far behind a lens an image will form.

shorter the focal length = wider the angle of view



Questions

What are some specific network camera applications?

- » Security surveillance for Banks, Shops, Offices, Warehouses.....
- » Remote monitoring of the house, daycare or schools



Can I monitor my camera from anywhere?

Yes

If on the same network, you need the camera's IP address.

If on the Internet, you need the WAN IP of the router or a domain name registered with a dynamic DNS provider. (Router must be configured for port forwarding)



Does my computer need to be on all the time if I use an IP camera?

No

Once the IP Camera is installed and configured, it can be accessed from any system using Internet Explorer.



Do I need a high speed Internet connection to use an IP Camera?

YES (for remote access)

Dial-up connections don't provide enough bandwidth for streaming video.

