

IP Surveillance 101

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Chapter. 1. Introduction

ACTi provides you a series of guides for your project from proposal stage to maintenance stage. They work as below

[IP surveillance 101]: Introduce to IP surveillance Solution

[IP surveillance Proposal Guide]: Making proposal to your customer

[IP Surveillance Deployment Guide]: Fulfill your project from proposal to practical to your customer.

[Tech Support and Troubleshooting Guide]: Find the root cause of your problem and solve it.

1-1 IP Surveillance 101 Preface

This **[IP surveillance 101]** aims to provide you a whole picture view about the IP Surveillance system and basic concepts about the everything involved in this system from image generation, network transmission to video management. We recommend you to see the outline of each chapter below and browse quickly through contents you are familiar with and look carefully for contents you are not familiar with.

1-2 Outline of each Chatper

1-2-1 Chapter1: Introduction to IP Surveillane solution

This chapter talks about what IP Surveillance system is and the evolution history about video surveillance system.

1-2-2 Chapter2: Building blocks of IP surveillance solution

Basically, for all Surveillance system, there can be 3 parts which are “Image block”, “Netowrk Transmission” and “Video Preview & Management”. This chapter will let you know how each part works

1-3 Contact us

Conatct your sales representative if you are intereseted in IP surveillance solution.

<http://www.acti.com/corporate/contact.asp>

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Chapter. 2. Introduction to IP Surveillance system

2-1 What is IP Surveillance Solution

IP Surveillance Solution belongs to the video surveillance system and it contains digitalized video & audio stream generation, stream transfer via network (LAN/WAN/Internet), stream storage, stream management and stream intelligence.

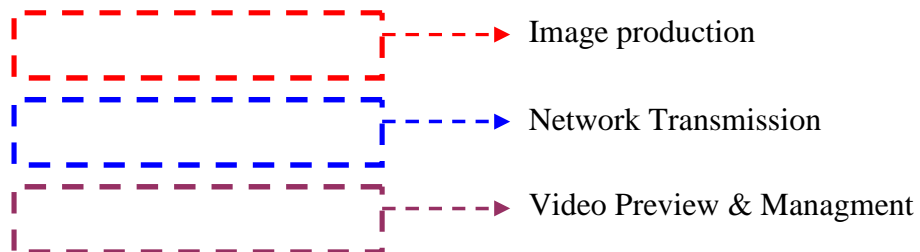
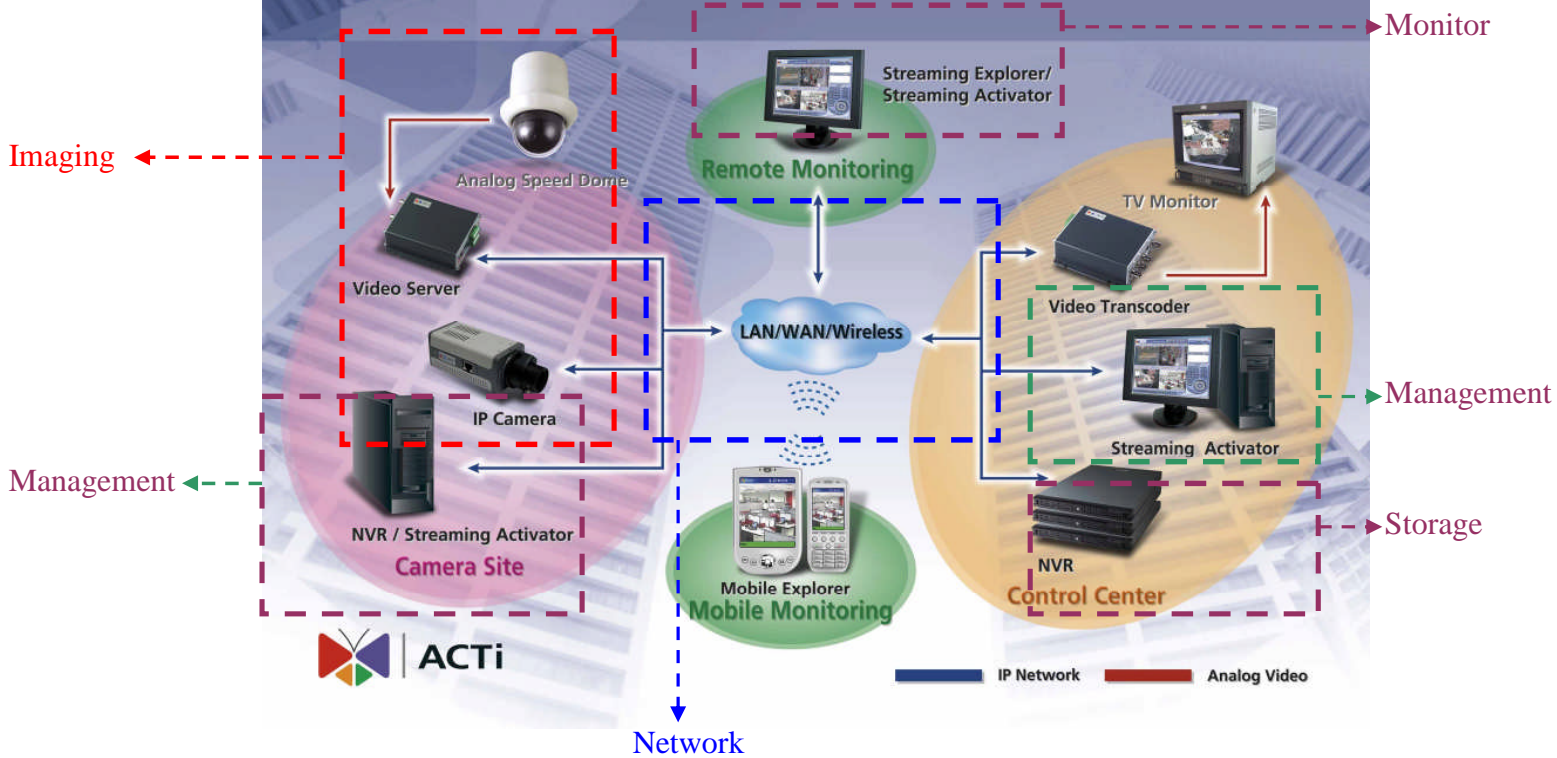
The main difference between IP Surveillance Solution and Analog Surveillance Solution is that IP Surveillance Solution uses network as the backbone to transporting data instead of using point-to-point coaxial cabling. IP Surveillance data includes video, audio, event information, device control and user-defined informations.

2-2 What is Video Surveillance system

The video surveillance system is a part of the security surveillance system that includes Fire & alarm security, access control and video surveillance. Each one of the security surveillance system are focusing on different aspects and each of the security surveillance system is somehow integrated with other systems in different applications.

The video surveillance system is focusing on surveillance by video that is we secure our property by video monitoring, video recording and video playback. Basically, there are four building blocks of the video surveillance solution including video generation, data transmission and video monitoring and video management as below.

Best MPEG-4 IP Surveillance Solutions



2-2-1 Video Generation Block

In this block, the video/audio data is generated.

2-2-2 Data transmission Block

In this block, data is transferred between the video generation block and the video monitoring block or the video management block. The data contains the video/audio stream, event information and control signals.

2-2-3 Video monitoring Block

In this block, guards or administrator can view image from the video generation block and determine if there's an event happening and the respective response actions.

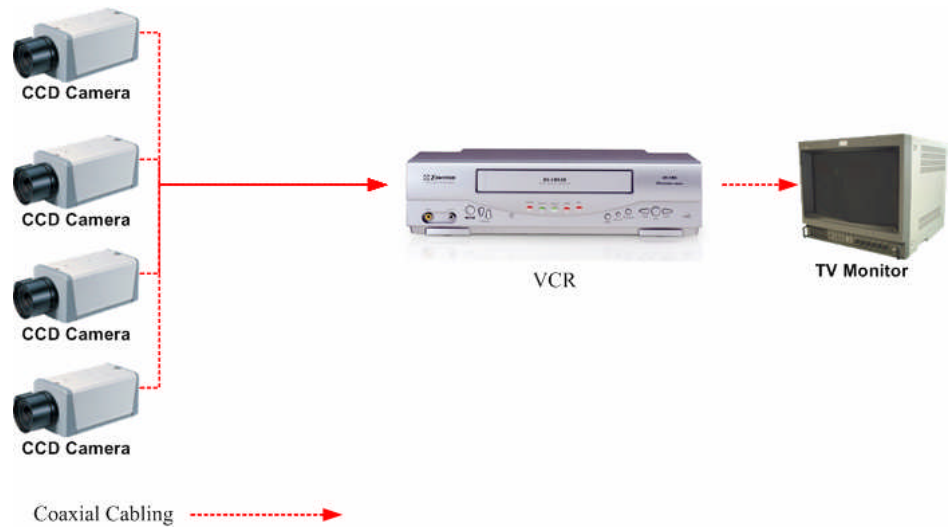
2-2-4 Video management Block

In this block, data could be stored, analyzed, and be played back in the future. The response action could be triggered upon an event and leaves a record for future event annalistic.

2-3 Video Surveillance system evolution

The video surveillance system exists for many years. The system starts from a purely analog system to current hybrid (including both analog and IP surveillance system) system and in the future 100% IP Surveillance system.

2-3-1 Analog CCTV system + VCR



2-3.1.1 Video generation block

Analog camera that generate analog video via coaxial output..

2-3.1.2 Data transmission block

All the data from camera and sensor to VCR is transferred

via directly point-to-point cabling. There are coaxial cables to transfer the analog video, RS-485 cables to transfer the control signals to the camera or to a VCR (Video Cassete Recorder) and alarm-in/alarm-out cables to transfer the signals from sensor to a VCR or from a VCR to a buzzer. Because there's are so many cables to install and maintain, the cabling cost is huge and increase the difficulties to maintain the system.

2-3.1.3 Video monitoring block

Use analog TV to view the images..

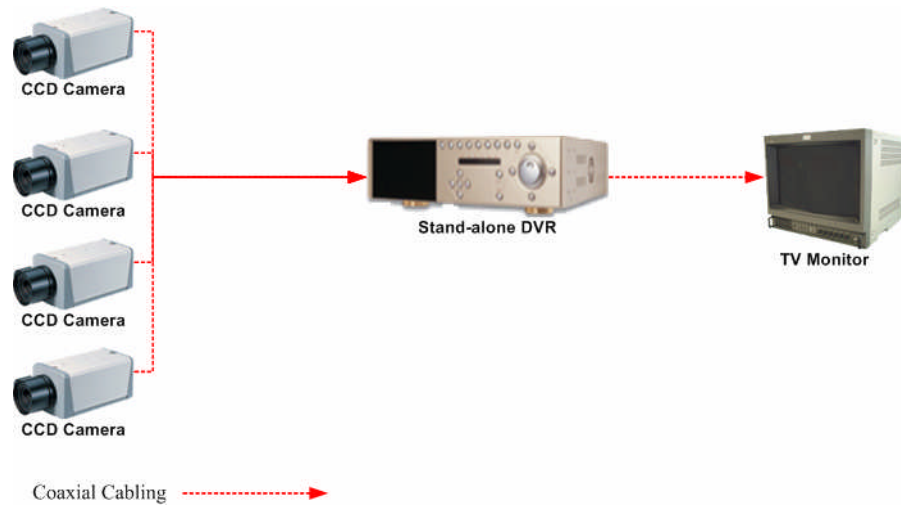
2-3.1.4 Video management block

The management is done via a VCR (Video Cassete Recorder). The VCR can record one camera's video of full frame at a maximum of 8 hours. That is, security operators have to replace the cassette every 8 hours and the cassette storage management requires a huge space a lot of human power and good storage environment (to prevent the video quality of the images stored in the cassette from worsening..

Sometimes, this system uses a quad/multiplexer with a VCR to increase its recording capacity camera number but this architecture will sacrifice either the image resolution or the image frame rate which decrease its security performance.

The video playback of a VCR is through manual Forwarding and Rewinding and the video is analized by operators. This playback mechanism will cost operators a lot of time when searching video for a specified time or event.

2-3-2 Analog CCTV system + DVR



2-3.2.1 Video generation block

Analog camera that generate analog video via coaxial output..

2-3.2.2 Data transmission block

All the data from camera and sensor to DVR is transferred via directly point-to-point cabling. There are coaxial cables to transfer the analog video, RS-485 cables to transfer the control signals to the camera or to a DVR (Digital Video Recorder) and alarm-in/alarm-out cables to transfer the signals from sensor to a DVR or from a DVR to a buzzer. Because there's are so many cables to install and maintain, the cabling cost is huge and increase the difficulties to maintain the system.

2-3.2.3 Video monitoring block

Use analog TV to view the images..

2-3.2.4 Video management block

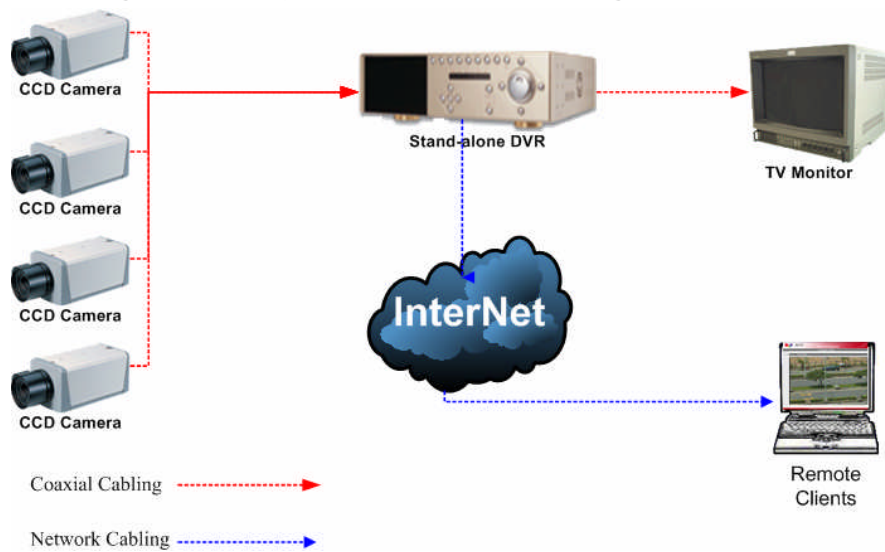
The management is done via a DVR (Digital Video Recorder). The DVR digitalize the video and compress the digital video and store the compression digital video. Because the compressed data is small and the HD's space increases significantly these years, a DVR can record a camera's video

of full frame for some days. This means the operator doesn't need to replace the cassette constantly. Besides, as long as the HD is not broken, the images quality stays the same unlike images stored in cassettes.

The DVR's video inputs are typically 4, 9, or 16 which means the quad and multiplexer functionality is built-in.

The video playback of a DVR is more advanced than VCR. It can search video by time, event and some advanced searching in addition to VCR's manual Forwarding and rewinding. This playback mechanism saves enormous time of the operators when searching for a specified time or event.

2-3-3 Analog CCTV system + networking DVR



2-3.3.1 Video generation block

Analog camera that generate analog video via coaxial output..

2-3.3.2 Data transmission block

All the data from camera and sensor to DVR is transferred via directly point-to-point cabling. There are coaxial cables to transfer the analog video, RS-485 cables to transfer the

control signals to the camera or to a DVR (Digital Video Recorder) and alarm-in/alarm-out cables to transfer the signals from sensor to a DVR or from a DVR to a buzzer. Because there's are so many cables to install and maintain, the cabling cost is huge and increase the difficulties to maintain the system.

All the data from DVR to a Client PC is via IP-based network (LAN/WAN/Internet). The PC can be anywhere with an network connection to the DVR.

2-3.3.3 Video monitoring block

Use analog TV to view the images..

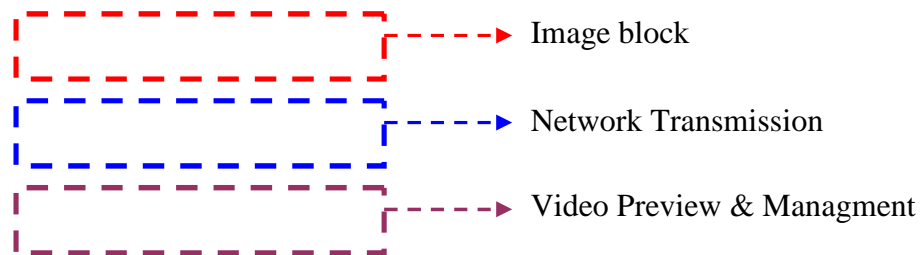
1. Use analog TV to view the images.
2. Use a PC to access the DVR and view the images.
The images could be live preview or recorded images.

2-3.3.4 Video management block

The networking DVR enables a remote PC to view the live preview or playback images in additional to all other features of a conventional DVR. This greatly enhance the video surveillance system's functionality and flexibility.

For conventional DVR introduction, please go to 1-3-2 Analog CCTV system + DVR.

2-3-4 IP Surveillance system + PC Servers



2-3.4.1 Video generation block

There's are two ways to generate the video.

1. Use an analog camera + video server.
2. Use an IP camera.

Either way, the video is digitalized and compressed.

2-3.4.2 Data transmission block

All the data from video server/IP camera to the PC servers is transferred via IP-based network (LAN/WAN/Internet).

Transmission based on IP-based network have advantages over analog cabling including 1. The number of cables 2. The length of cables 3. The location of the camera. 4. PoE connection.

1. The number of cables: In IP Surveillance system, multiple video input can share one network cable unlike the analog system cabling where each video input requires one coaxial cable. Besides, sometimes, the network infrastructure is pre-built in the building, the cabling cost is significantly small. Also, when adding a new camera, you just need to connect the IP camera to the nearest network switch instead of adding a new cable all the way from the control room to the camera. Both reasons save a lot cost.
2. The length of cables: In IP surveillance system, the network cross-nation is pre-built, it is possible for a control room at United Kindom to view cameras at USA or at China. But in analog surveillance system, because each video input requires a video cable from camera to the control room, you can't view a camera cross county or cross country Ex: view a camera in USA from China. IP surveillance system greatly enhance the system performance.
3. The locations of the cameras: In IP surveillance system, all the data is digitalized and can be transferred via wireless network and delivers the same image quality. With wireless connection, the camera can be installed at places where cabling is difficult or very costly. There's one special wireless (not the wireless we are talking about everyday) for analog system, but this special wireless has relative small transmission distance (less than 10M

according to practical using) and the image quality is bad even the wireless distance is small.

4. PoE connection: When using PoE connection, the power and the network signal can be transferred via one network cable. Which saves a lot of cabling cost

2-3.4.3 Video monitoring block

Use a PC to access the video server and view the images..

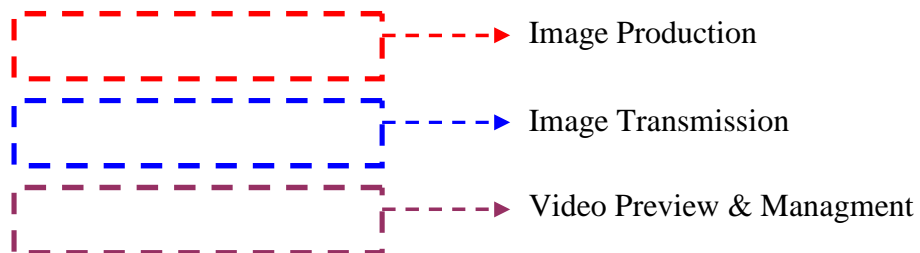
2-3.4.4 Video management block

The management is done via any PC server anywhere with a network connection to the video sever/IP cameras. There PC servers can deliver all the functionality a networking DVR has.

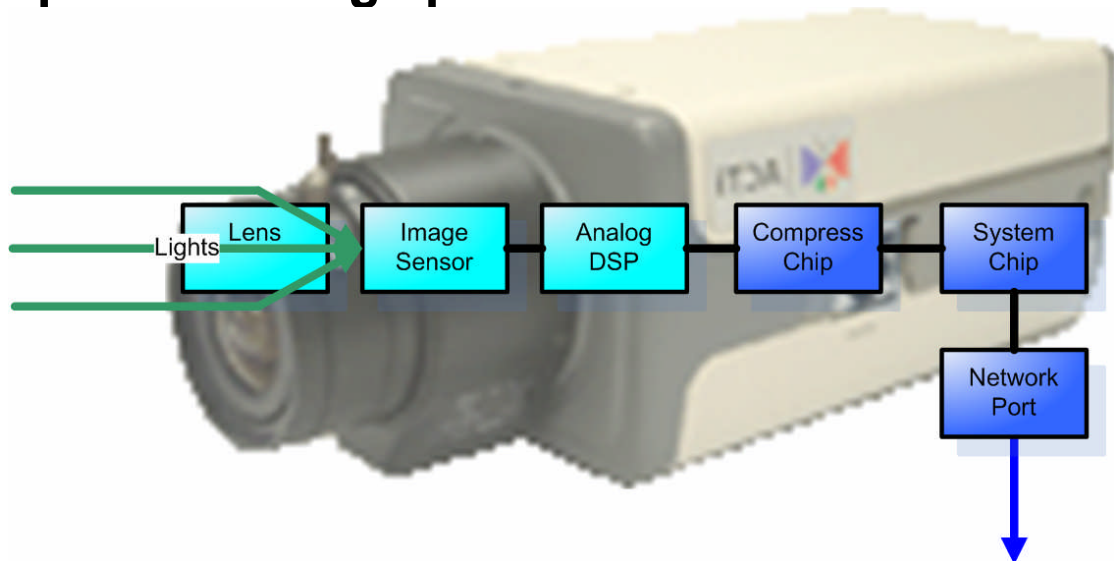
Chapter. 3. IP Surveillance Solution Building blocks

We think IP Surveillance solution can be divided into 3 building blocks as below.

- a. Image Production
Image is generated in this block.
- b. Image Transmission
Images is transmitted in this block to remote devices.
- c. Video Preview and management
All the image preview and management are done here.



Chapter. 4. Image production



For Video Surveillance system, the image quality is very important. A good quality video can always be helpful for event follow-ups. The video is produced in Image production block, Below is how the system works.

- a. Lighting coming through the lens and focus on the CCD
- b. CCD transform the lighting into raw image
- c. The analog DSP modify the raw image to be similar as what human eyes see and send image to compression chip
- d. The compression chip accepts the images and compress it into compressed images
- e. The system chip manages the system about how the compressed images will be handled
- f. The compressed images are sent via network ports.

4-1 Analog Image production

4-1-1 Image sensor (CCD, CMOS)

The image sensor receive lights and transform it into electric signals. There are two types of camera image sensor.

- a. CCD (Charged-coupled device) sensor
- b. CMOS (Complementary Metal Oxide Semiconductor) sensor

CCD provides better sensitivity and are more expensive

while CMOS provides lower sensitivity and are much cheaper. Generally, CCD is still the mainstream of the Surveillance cameras image sensor.

4-1.1.1 CCD sensor

The CCD sensor was invented in 1969 by Willard Boyle and George Smith at AT&T Bell Labs. It is used in video cameras, digital cameras and optical scanners. It has relative high sensitivity compared with CMOS sensor. But if there's a very bright object in the scene (such as directly sunlight), the CCD may produce images with vertical stripes below and above the object. This phenomenon is called smear.

4-1.1.2 CMOS sensor

CMOS circuits were invented in 1963 by Frank Wanlass at Fairchild Semiconductor. The CMOS provide less sensitivity. Thus, in low lighting environment, CMOS sensor will provide either very dark images or images with a lot of noises.

4-1-2 Progressive scan vs interlaced scan

For images sensors, there are two types of scanning mode. Scanning mode is how an image sensor captures the images. Each image sensor will have one scanning mode only. mode.

The major comparison between these two scanning mode are





- A. CCD sensitivity

- B. Image Quality of motion images.

The sensitivity comparison between two scanning mode is clear while the image quality comparison is always a doubt.

Thus we snapshot the video for you to determine.

Scanning mode	Sensitivity	Image Quality
Progressive	Good	AXIS211 *3

			
Interlaced	Normal	Excellent	SONY RZ25N sec *3 
	Interlace -Blending*1		ACTi, CAM-6100, *3 
	Interlace -Motion*2		CAM-6100 *3 

*1: Interlace blending is a type of motion compensation for better motion images. Its is done during image compression.

*2: Interlace blending is a type of motion compensation for better motion images. Its is done during image compression.

*3: The shutter speed are the same as 1/60sec. The bit rate is AXIS: 5M bit, SONY: 2M bit rate, ACTi: 3M bit rate

From picture above,

- a. Interlace-blending and interlace-motion provides the same and even better on motion images compared with progressive CCD.
- b. Interlace w/o any compensation provides worse quality than Progressive Scan.

4-2 Advanced Camera Function

Camera have used some advanced functions to provide you the images like what human eyes see. Please see below for their introduction.

4-2-1 White Balance

When CCD transforms the lighting into electric signals, it's very hard for it to tell the color of each signal. That's why you sometimes see camera images have different color with what human eyes see. White balance enables Analog DSP to modify to color to what human eyes see. If the white balance function is not set properly, you might see picture w/ wrong color as below

True images



White balance fail



4-2-2 Iris

Iris and electric shutter is a way for camera adopt to different lighting conditions (ex: the light is very strong in 2:00PM and the light is very little in 11:00PM). The goal is to ensure the picture is not too bright or too dark. Iris is to control the lighting income to the CCD while electric shutter controls how much lighting the CCD will accept by time length.

4-2-3 Electric shutter

Iris and electric shutter is a way for camera adopt to different lighting conditions (ex: the light is very strong in 2:00PM and the light is very little in 11:00PM). The goal is to ensure the picture is not too bright or too dark. Iris is to control the lighting income to the CCD while electric shutter controls how much lighting the CCD will accept by time length.

Also, high speed electric shutter is very important if you want to see high speed moving objects. But you will have less lighting income if you use high speed shutter.

Acronym	Full name	Description
ES:	Electric Shutter	Electric Shutter
AES:	Auto Electric Shutter	Auto Adjust the shutter speed by lighting conditions

4-2-4 Gain Control

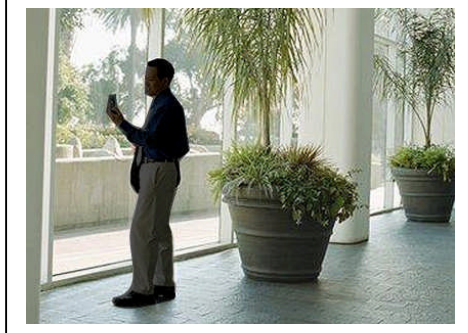
Gain Control allows camera to see in lower lighting environments. This is done at Analog DSP by electrically enhance the images coming from CCD.

Acronym	Full name	Description
AGC:	Auto Gain Control	Gain control is done automatically

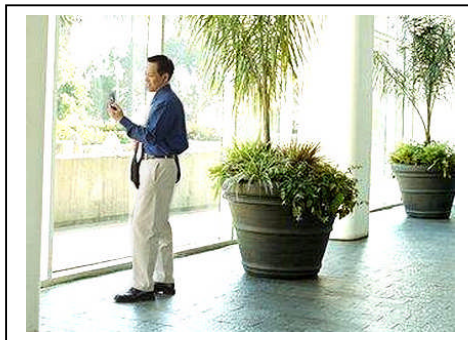
4-2-5 BLC (BackLight Compensation)

When a camera shooting from indoor to outdoor, you will have either

- a. Over bright outdoor images



- b. Too dark indoor images

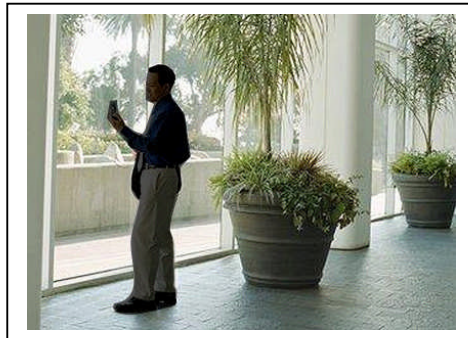


The fact you can't obtain clear images in both indoor & outdoor is called Backlighting problem. BLC (Backlight Compensation) and WDR (Wide Dynamic range) is to solve this problem. The major difference between WDR and BLC is the WDR can solve more Backlighting problem while BLC always fail when the Backlighting problem is not very little.

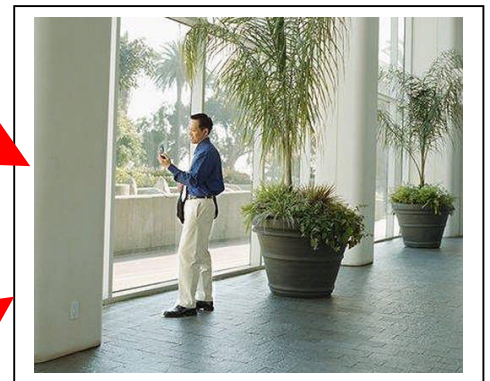
4-2-6 WDR (Wide Dynamic Range)

WDR (Wide Dynamic Range) means the camera can accept more lighting range than normal camera. WDR aims to solve the Backlighting problem as BLC. Compared with BLC, WDR is a newer technology and provides better performance.

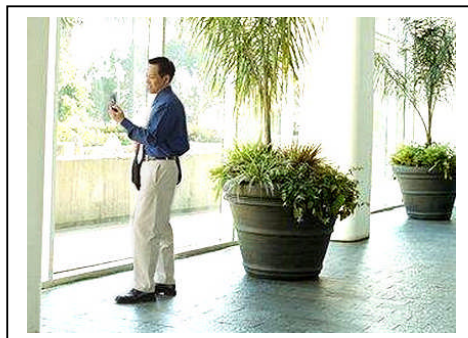
Without WDR



With WDR



Without WDR



4-2-7 Day/Night function

Day/Night function means the camera has the ability to see clearly in both normal lighting environment (day) and low lighting environment (night). This function involves two parts

- a. IR light accept mechanism
 - Always accept IR light
 - Always reject IR light
 - Auto switch to accept or reject IR light
- b. Auto Switch between color mode and B&W (Black & White) mode.

There are 3 types of Day/Night function and Below is their comparison table.

Day/night type	Color and B&W switch	IR Filter Control			Sensitivity At night mode	Color rendering
		Auto switch	Always IR-cut	Always IR-pass		
Camera w/ mechanical IR-cut /IR-pass filter switch	Auto	●			Best	Best
Camera w/ fixed IR-cut filter only	Auto		●		Fair	Best
Camera w/ fixed IR-pass filter	Auto			●	Best	Fair (Color might shift at Day time)

As you can see from the table above. Type1 provides better performance on day/night function. When you buy a Day/Night camera, make sure it is type1.

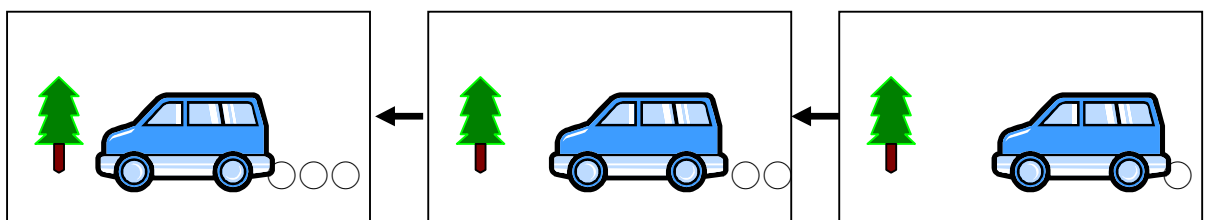
4-3 Digital Compression

4-3-1 Video compression standard

There are many video compression standard, we can divide them into two types: Single frame compression and multi-frame compression.

4-3.1.1 Single Frame compression

This compression see each image frame as an individual picture and compress them one by one.



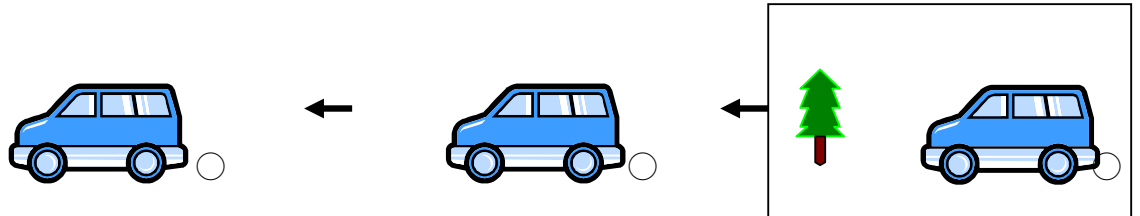
Single Frame compression technology includes

- MJPEG

MJPEG means Motion JPEG. It is a video codec where each image frame is separately compressed into a JPEG image.

4-3.1.2 Multi-Frame compression

This compression compresses multi-images together. In the first frame, all data is stored. In the later frame, only the image variation is compressed. This technology is to reduce the image data size. With small data size, the storage and network requirement will be smaller as well.



Single Frame compression technology includes

- MPEG-1

MPEG is a technology developed by the Moving-Picture-Expert-Group. MPEG-1 is their initial video and audio compression standard. It is the VCD video Today.

- MPEG-2

MPEG-2 is well known as DVD quality standard. It provides better quality than MPEG-1 but also requires a lot of bandwidth and storage size.

- MPEG-4

MPEG-4 is developed from MPEG-2 to have better image compression ratio. MPEG-4 has many different standards like

- a. MPEG-4 SP (Simple Profile)
- b. MPEG-4 SH (Short Header)
- c. MPEG-4 ASP (Advanced Simple Profile)

- H.264, (also know as MPEG-4 part 10)

H.264 is next generation's compression standard. It provides even better compression ratio than MPEG-2 but it requires a lot more compression and decompression power on encoder and decoder site. Because of the computing power requirement, H.264 is still some steps away from current IP video Surveillance system.

4-3.1.3 Overall Performance

Please see the table below for comparison based on either a. Same video quality
b. Same bit rate consumed
c. Bit rate requirement by frames

Same Video Quality

	Video Quality	Bandwidth required	Storage Size required
MJPEG	Same	Very Big	Very Big
MPEG-2	Same	Very Big	Very Big
MPEG-4	Same	Small	Small

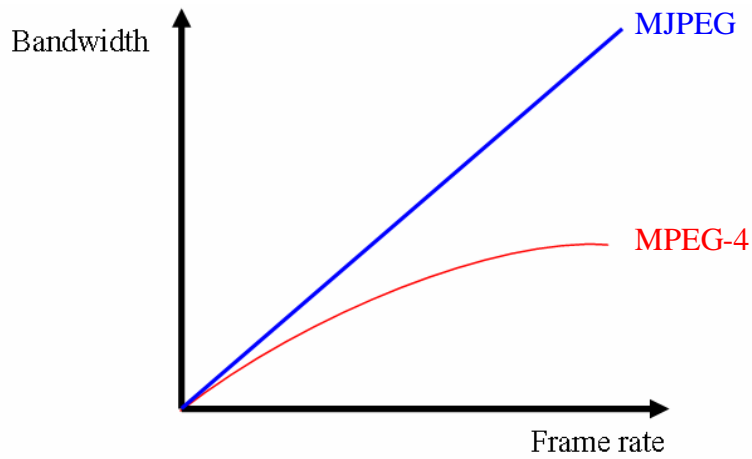
NOTE: H.264 is not listed because the discussion is about current IP Surveillance system compression standard.

Same Bit rate

	Video Quality	Bandwidth required	Storage Size required
MJPEG	Fair	Same	Same
MPEG-2	Fair	Same	Same
MPEG-4	Best	Same	Same

NOTE: H.264 is not listed because the discussion is about current IP Surveillance system compression standard.

Bandwidth requirement by frame rates






4-3-2 Advanced video compensation

4-3.2.1 Interlace and motion compensation

For some advanced video compression technology, the interlace problem can be solved during image compression and produce excellent motion images.

Please see the table below for how the interlace compensation increase the interlace images.

Interlaced	Normal	SONY RZ25N 
	Interlace -Blending*1	ACTi, CAM-6100 

	Interlace -Motion*2	ACTi, CAM-6100 
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4-4 Camera installation

4-4-1 Lens

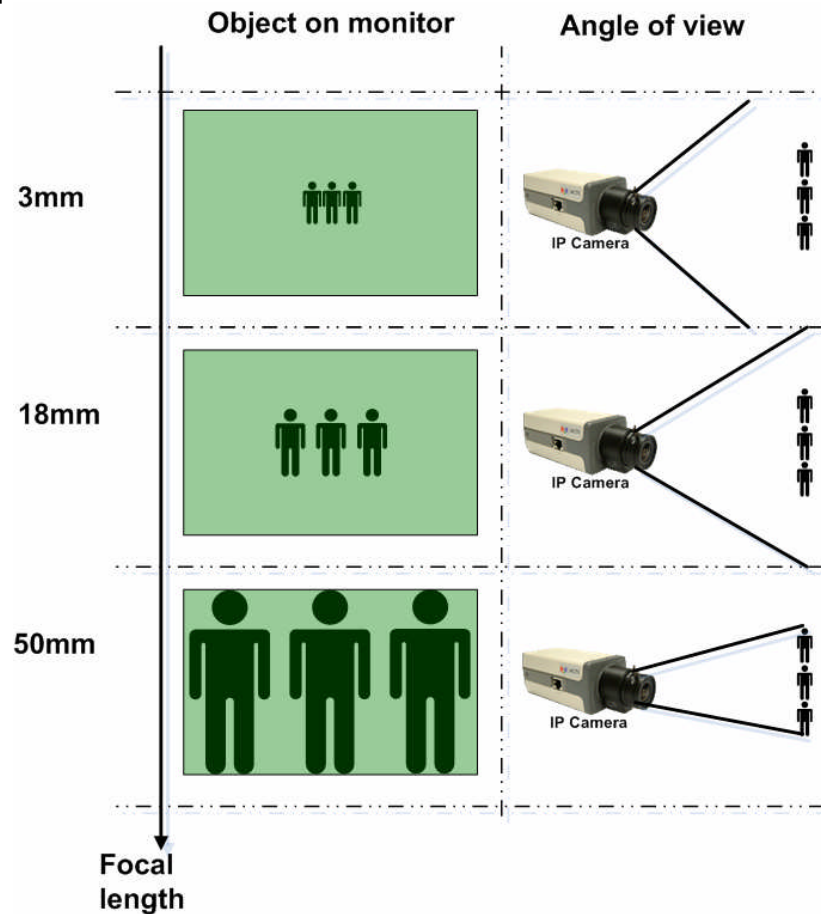
Lens is used for your camera to focus on target schemes and adjust the lighting input. For a lens, there are some specs for you to consider.

4-4.1.1 Auto/Manul Iris

Auto Iris lens can adjust the iris according to the lighting conditions while manual iris's iris is fixed.

4-4.1.2 Focal length

Basically, focus length directly effect the lens' viewing angle and viewing distance and it is always marked as "f" in lens spec.



4-4.1.3 Aperture

This spec is marked as “F” in lens spec. The smaller the aperture is, the more sensitive the lens is.

4-4.1.4 IR correct

A lens with IR correct function will eliminates the focus shift problem for Day/Night camera during Day/Night switch.

4-4-2 Housing

Housing is used to protect the camera from environmental factors and keep the camera in stable operation system. It is used to prevent

- a. Dust
- b. Vandalism
- c. Rain
- d. Too cold or too hot environment.

4-4-3 Mount, bracket

Mount and bracket is used to secure the camera/housing to where you want to install. There are many kind of mount and bracket available, you have to buy them according to your camera/housing requirements.

- a. camera/Housing weight
- b. mount location
- c. cabling requirement

Chapter. 5. Image transmission

After the image is generated, it has to be transmitted to remote clients. This procedure is image transmission. IP is a kind of network transmission protocol. Therefore in IP surveillance system, the image transmission is done via the network. Then we will introduce network concepts to you in this chapter.

a. Basic introduction

We will tell you basic ideas about the network basics.

b. Network connection

How the IP camera/Video server/Remote clients is connected to the network.

c. Network environment

How the IP camera/Video server/Remote clients is connected to the network.

d. Advanced network function

Some advanced network function.

e. Network glossaries

Some network glossaries..

5-1 Basic introduction

Basically the network is like to transportation system in the city.

We have

A. House, buildings

→ a network devices

B. House address on the road

→ the IP address of a network device

D. Different goods to be transported

→ Different network data (ex: video)

C. Different transport devices (ex: truck, car)

→ Different network connection type (ex: wired, wireless)

E. Different transport policy (ex: do we check about delivery status?)

→ Different network transmission protocols (ex: TCP/IP, UDP)

After the image is generated, it has to be transmitted to remote clients. This procedure is image transmission. IP is a kind of network transmission protocol. Therefore in IP surveillance system, the image transmission is done via the network. Then we will introduce network concepts to you in this chapter.

5-1-1 IP address

IP address is the virtual address of a network device in the network. Each device has its unique address.

IP address contains 4 groups of 3 digits separated by a dot. Each group of digits is in the range 0-255.

Example: 192.168.64.28.

For each device within the same network segment, they will share the same first 3 group of digits.

Example: Any camera within the same network segment as 192.168.64.28 will be 192.168.64.xx like

- a. 192.168.64.23
- b. 192.168.64.253

5-2 Network connection

There are three types of network connection as below.

5-2-1 Wired

The network device is connected to the network via direct network cabling. This network has different kinds of type

5-2.1.1 10 Mbps Ethernet

This is a very old Ethernet transmission type, which the transmission speed is 10 Mbps. It is now replaced by 100 Mbps Fast Ethernet type.

5-2.1.2 Fast Ethernet (100 Mbps)

This transmission type is exactly the same as 10Mbps Ethernet except for its 100 Mbps transmission speed (10X times more). This is commonly what we use daily in our offices.

5-2.1.3 Gigabit Ethernet (1,000 Mbps)

Gigabit Ethernet is the next transmission type after the Fast Ethernet. The transmission speed on it is 1,000 Mbps. Because of its high transmission speed, it is commonly used as network backbone in the IP surveillance system. (In other words, it is used to be a high way between two cities).

5-2.1.4 10 Gigabit Ethernet (10,000 Mbps)

This is the most recent and fastest of the Ethernet Types. It is currently specified in IEEE 802.3AE. It's not commonly used in IP surveillance system yet.

5-2-2 PoE (Power Over Ethernet)

PoE follows the standard of IEEE 802.3af. PoE means the network cable can

- a. Transmits network signal
- b. Provide the power to the network devices.

If we use PoE connection, we will need only to deploy the network cable to the network device instead of network cable and power cable at the same time. It can greatly decrease the installation fee.

Normally, the PoE's distance is limited into 100M.

PoE has two standards

1. Alternative A: Power and Data are running on the same line inside the network cable.
2. Alternative B: Power and Data are NOT running on the same line inside the network cable.

Different PoE Standards are not compatible with each other. Make sure you select the right PoE standard.

5-2-3 Wireless

Although most current buildings are with network cable pre-built, there are still many places where

- a. network cable can't reach
- b. it's very expensive to lay network cable

In these cases, we will need wireless connection. There are two types of wireless connections, one is for analog and the other is for digital. Analog wireless has a lot of problems because it is easy to be effected by the environmental factors. Digital wireless provides outstanding performance compared to that.

Digital wireless differs by the protocol they use. We have 802.11a, 802.11b, 802.11g.

No	Wireless protocol	Wireless band	Transmission speed	Transmission distance
1	802.11a	5.8GHz	0~11 Mbps	Best
2	802.11b	2.4GHz	0~11 Mbps	Medium
3	802.11g	2.4GHz	0~54 Mbps	Small

Notice that, 802.11a is not a free channel band in each country. It means that, you might need to pay to use this channel. Be sure to know your government policy about it before you buy 802.11a devices.

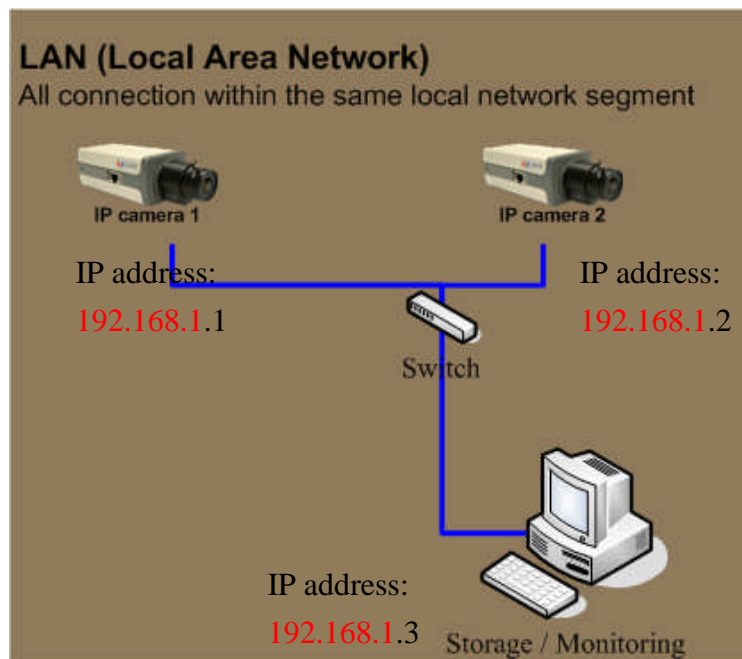
5-3 Network Environment

5-3-1 LAN/WAN/Internet

Below is introduction about LAN and WAN.

5-3.1.1 What is LAN

LAN means Local Area Network. It means all the network connections are within the same local network segment. For instance all the devices below are 192.168.1.xxx



5-3.1.2 What is WAN

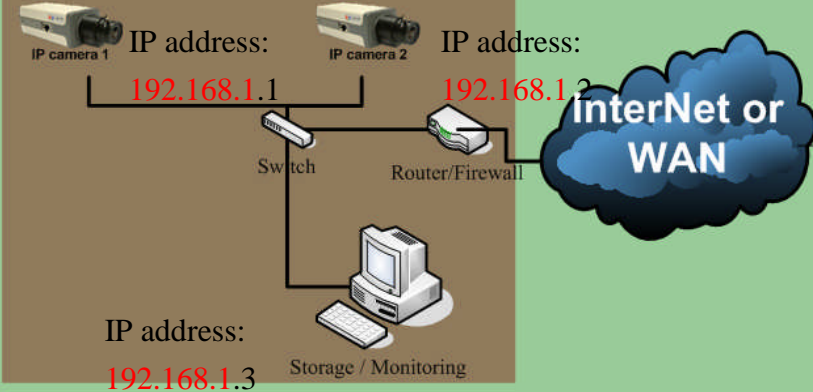
WAN means Wide Area Network. It means all the network connections are not just within the same local network segment. The connection could via routers and internet.

WAN (Wide Area Network)

Connections are across different LAN via router or Internet instead of being within the same local network segment

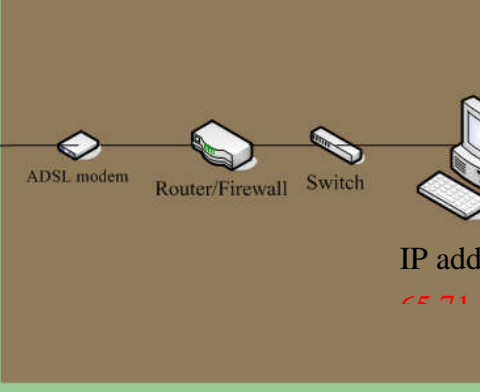
LAN (Local Area Network)

All connection within the same local network segment



LAN (Local Area Network)

All connection within the same local network segment



5-4 Network protocols

There are variable network protocols. In IP Surveillance system, we would always confront two protocol

- a. Transportation protocol : The network package is carried by this protocol. It simply transports data between clients.
- b. Session protocol : These protocols are based on Transportation protocols. Each session protocol provides different functions.

5-4-1 Transportation protocol

Transportation protocol	Full name	How does it work in IP surveillance system?	Packet lost?
TCP	Transmission Control Protocol	The sender (Video server/IP) will confirm if the receiver (Remote PC) successfully receive the network package. If not, the sender will re-send)	No, unless in a very complicated environment
UDP	User Data Protocol	The sender (Video server/IP) will NOT confirm if the receiver (Remote PC) successfully receive the network package.	Yes, in all environment

5-4-2 Session Protocol

Session Protocol	Transport Protocol	How is it related to IP Surveillance solution
HTTP (Hyper Text Transfer Protocol)	TCP	This is generally used for video server to communicate with remote servers or be login by remote clients.
FTP (File Transfer Protocol)	TCP	This is used for video sever/IP camera or PC servers to send notification or message to a FTP server.
SMTP (Send Mail Transfer Protocol)	TCP	This is sued for video server/IP camera or PC servers to send notification/messages to E-Mail clients.
RTP/RTSP (Real Time Protocol/Real Time Streaming Protocol)	UDP	This is used to streaming video with faster speed.
Multicast	UDP	This is used for video server/IP camera or PC servers to send one stream and enable multiple user to view it.

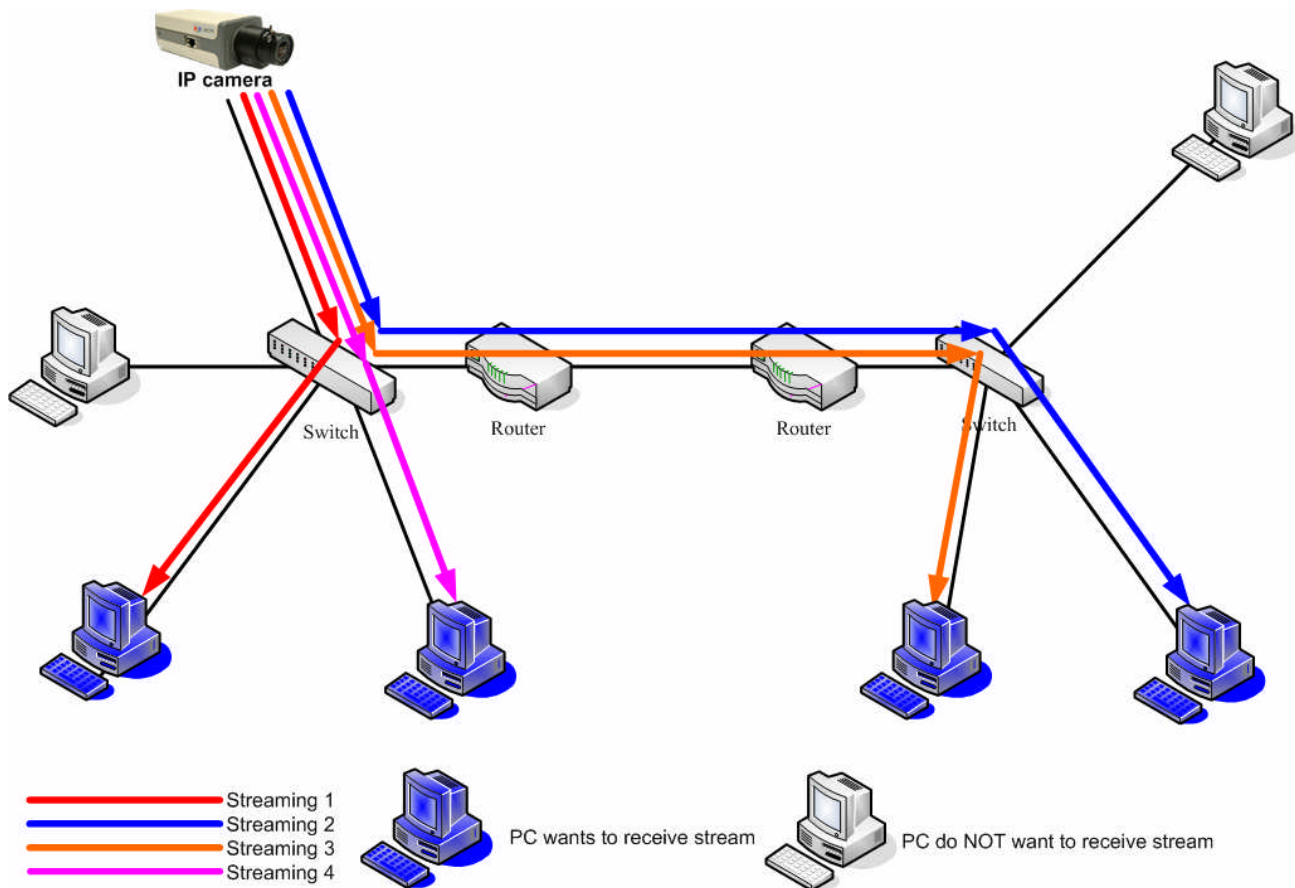
5-5 Advanced network function

5-5-1 Mutlicast/Unicast

Multicast is a kind of network communication type. There are two kinds of communication type including “Unicast” and “Multicast”. Each of them works differently and is used in different applications. We will use an IP camera streaming to multiple PC as an example to explain Unicast and Multicast.

5-5.1.1 Uni-cast:

Unicast is a network communication between a single sender (IP camera, video server) and a single receiver (Client PC or NVR) over a network. With unicast, the IP camera has to send an individual streaming for each client wish to see the images.



With unicast, the more the client number is, the greater the network bandwidth required and the greater loading of the IP camera (sender)

5-5.1.2 Multicast:

Multicast is a network communication between a single sender (IP camera, video server) and multiple receiver (Client PC or NVR) over a network. With multicast, the IP camera can send just one streaming and each client can receive the streaming.

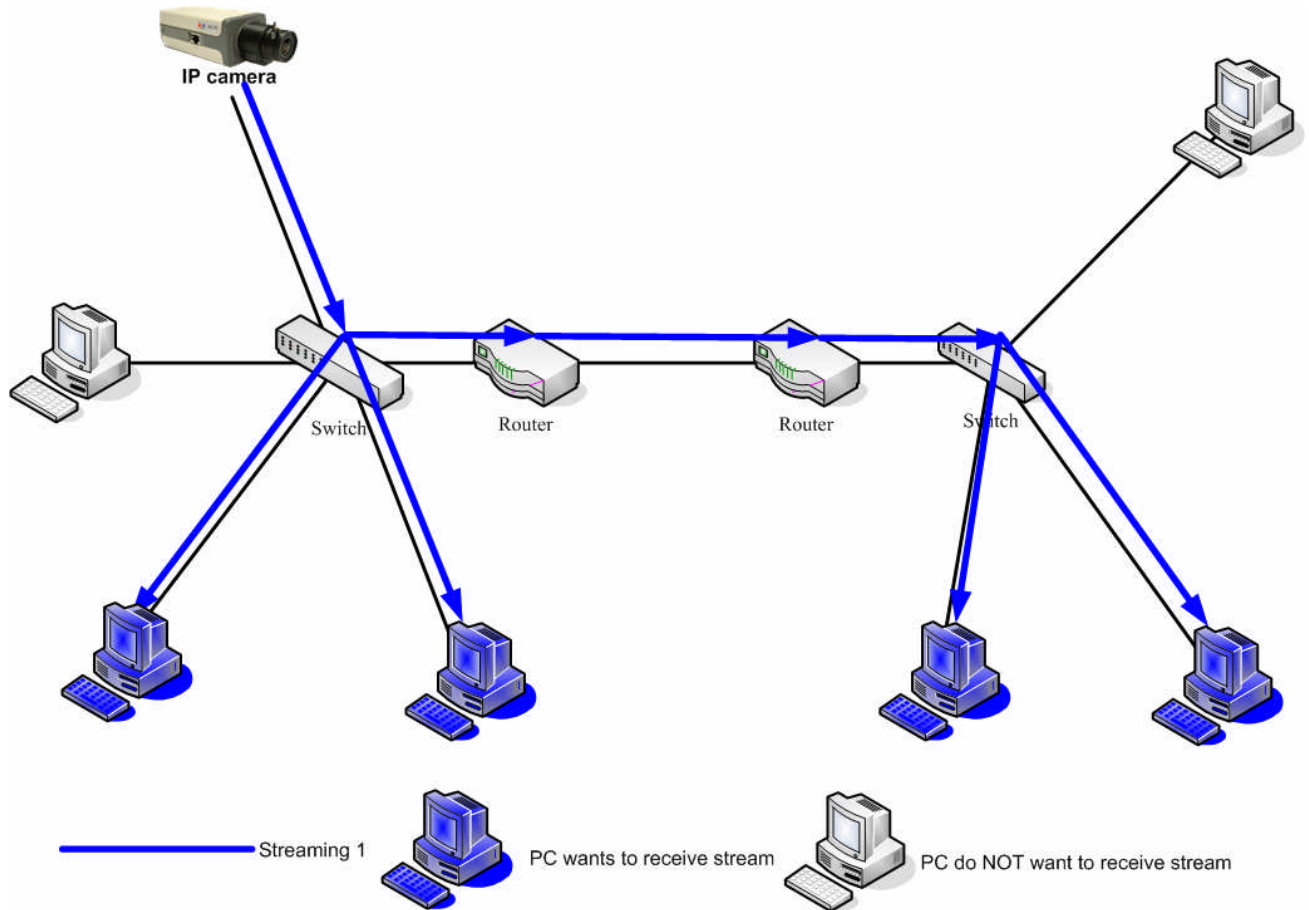
With multicast, even with the client number increasing, the network bandwidth is still the same and the same loading of the IP camera (sender).

NOTE: The streaming transmitted by Multicast might be unstable and cause the images to either “Drop frame” or “Generate mosaic” when network is busy. This is because Multicast is using UDP protocol to transmit the data and the UDP protocol might cause some network package to loss

during transmission

5-5.1.3 Multicast with IGMP

Multicast with IGMP can send streaming only to PC wanting to receive it.

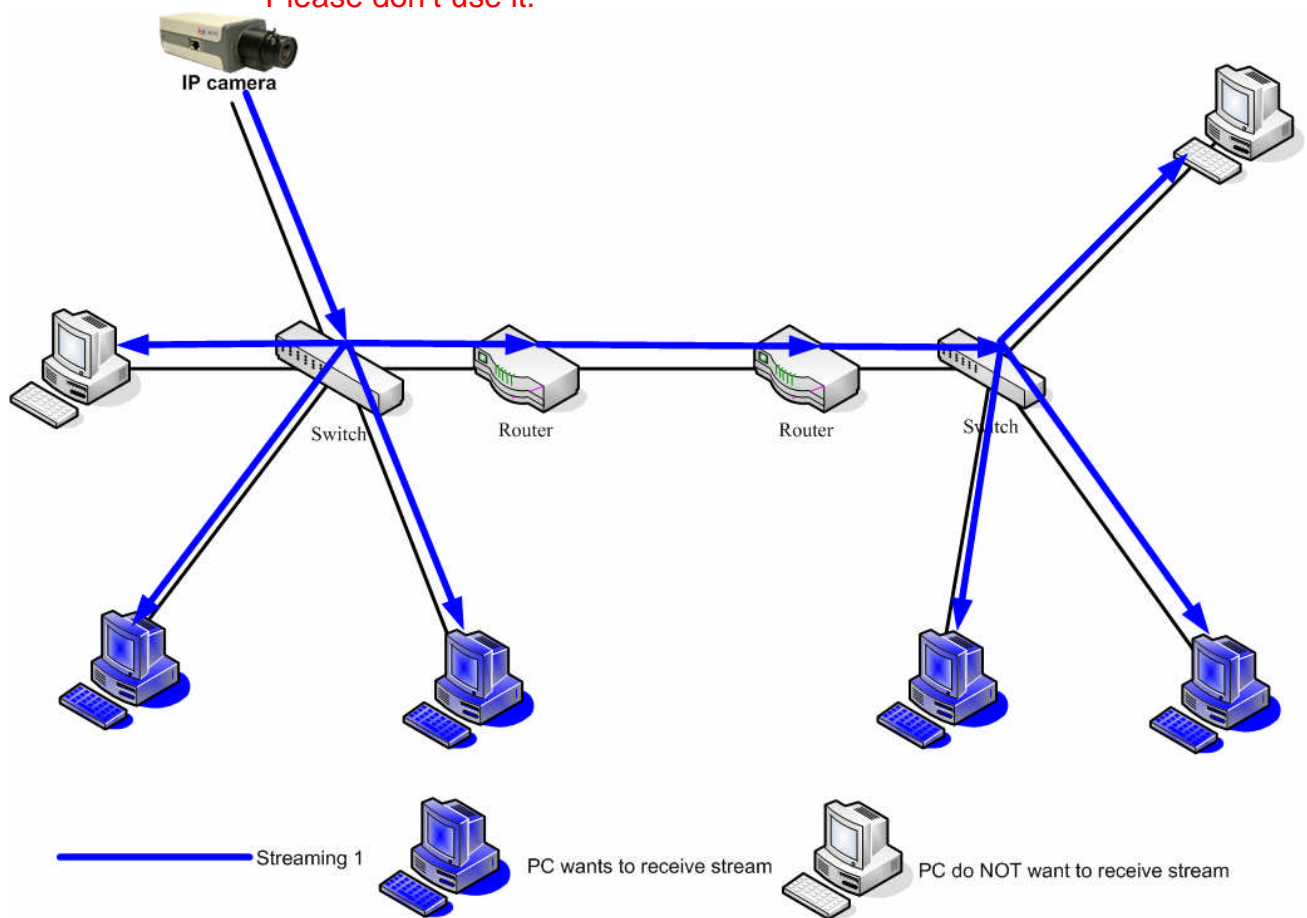


5-5.1.4 Multicast without IGMP

Multicast without IGMP send streaming to every PC on the network.

If any of the sender (IP camera) and the related network switch/router doesn't support IGMP, the multicast with IGMP will not work.

NOTE: Multicast without IGMP is very likely to decrease your network performance and cause a lot of trouble. Please don't use it.



5-5-2 QoS

QoS means Quality of Services. It is used to guarantee the network package is transmitted with the highest priority.

Example: If your network has two network devices

- a. Employee surfing on the internet
- b. Video server/IP camera streaming Video

It is very important to ensure the streamings from video server/IP cameras to be transmitted first. Then transfer the employee's internet datas. In this case, you will need QoS functions to do that.

5-5-3 Fail-over

To ensure the network connection is always on. It's very important to have "Fail-over" function. Fail-over function's pre-requisite is that your network devices has two network ports.

With two network ports connected to the the same or different network systems,

Example: Port A=> Network System A

Port B=> Network System B

If the network system A fails, the port B can take over all the network transmission and enables the video server/IP camera working normal.

5-5-4 VPN

VPN means Virtual Private Network. It is a private communication network usually within a company or by several different companies to communicate over a public network. It enables all the transmission over the public network as secured as if it is within your local networks.

5-6 Network Glossary

5-6-1 DNS (Domain Name System)

Domain name system makes a virtual link from domain name to IP address. Normally we connect to a network device via IP address (Ex: 59.133.24.97). It's not convenient for user to remember so many relatively meaningless digits, but a user can remember a domain name easily. (Ex: www.yahoo.com)

With Domain Name system, you simply click the Domain name and you can connect to the devices via IP address.

5-6-2 DDNS (Dynamic Domain Name System)

DDNS works the same with DNS except one thing. DDNS's IP address is constantly floating. Thus, the virtual link between domain name and IP address must be dynamic according to the IP change.

Why you buy internet connection from your ISP (Internet Service Provider), it's always cheaper to buy a connection with floating IP instead of fixed IP. That's why we need DDNS.

Chapter. 6. Image Preview & Management

Image preview and management block is where the IP Surveillance system interacts with the end user. Its function can be divided into 4 parts

6-1 Preview

End user can preview the images via different clients and different modes. (It includes the video and the audio from the video server/IP camera)

6-1-1 Viewing Clients

PDA, PC, mobile phones, analog monitor

6-1-2 Viewing Modes

Multichannel display, Sequence display, single channel display.

6-2 PTZ control

End user can control the PTZ action. The PTZ control can be done via different ways

- a. Software Interface
- b. Joystick
- c. Control Panel

6-3 Storage

IP Surveillance records video/audio for future event tracking and follow-ups. In some countries, the law enforce the bank to save recordings for 1 months. It's very important to know how many day's recording your system can record.

To do that, we must know our data rate and HD required.

6-3-1 Knowing the data rate

Data rate is the storage size growth rate of the recording.

6-3.1.1 Bit rate instead of FPS

The data rate of MPEG-4 is calculated differently from MJPEG.

-MPEG-4 : Data rate = Bit rate \pm 30%

-MJPEG : Data rate = Image size per frame * frame number

This is because of the MPEG-4 and MJPEG 's compression nature. MJPEG compress the image frame by frame but the MPEG-4 compress a group of images.

NOTE: for MPEG-4 system, you need to prepare 30% buffer as its data rate is floating.

6-3-2 Storage size = Data rate x Recording Time

The calculation is simple as topic. You can also refer to the storage table from the vendor.

Recording Requirement	Video Settings			Time Frame					
	Resolution	Frame Rate		Bit Rate	1 sec	1 day	14 days	30 days	60 da
		NTSC	PAL						
D1	30	25	1.5 M	187.5 K	16.2 G	226.8 G	486.0 G	972.0 G	
	15	12	750 K	93.8 K	8.1 G	113.5 G	243.1 G	486.3 G	
	10	8	500 K	62.5 K	5.4 G	75.6 G	162.0 G	324.0 G	
	5	5	256 K	32.0 K	2.8 G	38.7 G	82.9 G	165.9 G	
	1	1	56 K	7.0 K	0.6 G	8.5 G	18.1 G	36.3 G	
CIF	30	25	750 K	93.8 K	8.1 G	113.5 G	243.1 G	486.3 G	
	15	12	384 K	48.0 K	4.1 G	58.1 G	124.4 G	248.8 G	
	10	8	256 K	32.0 K	2.8 G	38.7 G	82.9 G	165.9 G	
	5	5	128 K	16.0 K	1.4 G	19.4 G	41.5 G	82.9 G	
	1	1	28 K	3.5 K	0.3 G	4.2 G	9.1 G	18.1 G	

6-4 Event handling

When there's any event, IP Surveillance can do immediate actions automatically. This can increase the event handling efficiency.

6-4-1 Event types

The IP surveillance system can trigger an action based on these events.

6-4.1.1 Motion Detection

If the motion is detected in any channel with motion detection pre-set, it can trigger an event.

6-4.1.2 Alarm Sensor (DI)

If the the system receive the alarm signal from alarm sensor, it can trigger an event.

There are many types of alarm sensors to detect many different kinds of event. Example: Motion detection, Smoke detection, Temperature detection and ..etc.

6-4.1.3 System Error

If the the system fails, it can trigger an event.

Example: - Video loss
- Connection lost
- HD error

6-4-2 Event Actions

6-4.2.1 Alarm audio (PC speaker)

The system can send out alarm audio via PC speaker.

6-4.2.2 DO devices

The system can activate respective DO device such as broadcast system to do broadcasting.

6-4.2.3 Start recording

The system can start recording target channel's video for programmable time.

6-4.2.4 Send message and recording to FTP

The system can send event message and event snapshot or recording to a FTP server.

6-4.2.5 Send message and recording to E-mail

The system can send event message and event snapshot or recording to an E-mail account.

6-4.2.6 Keep an log

The system can keep an log for future tracking.