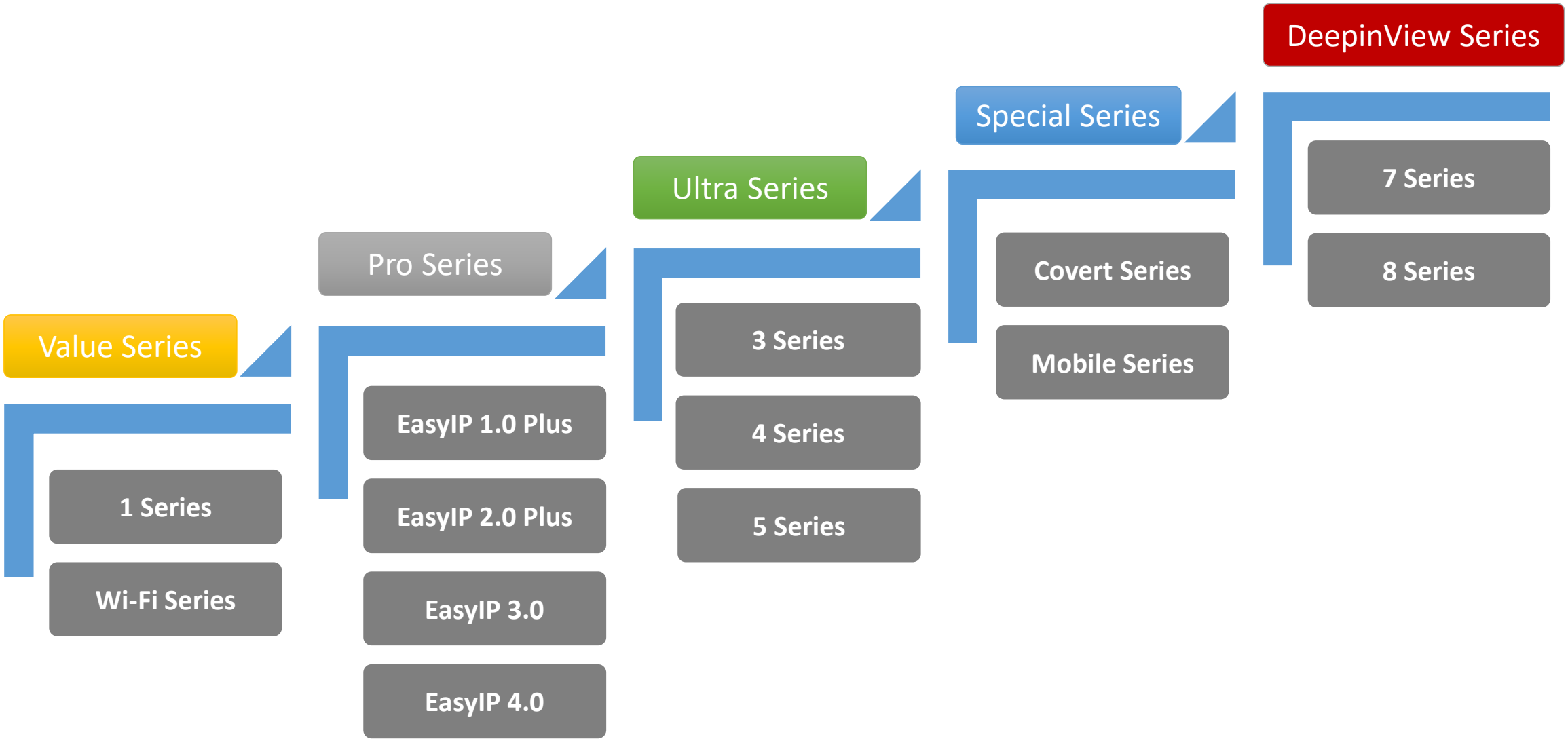
Hikvision IP Camera

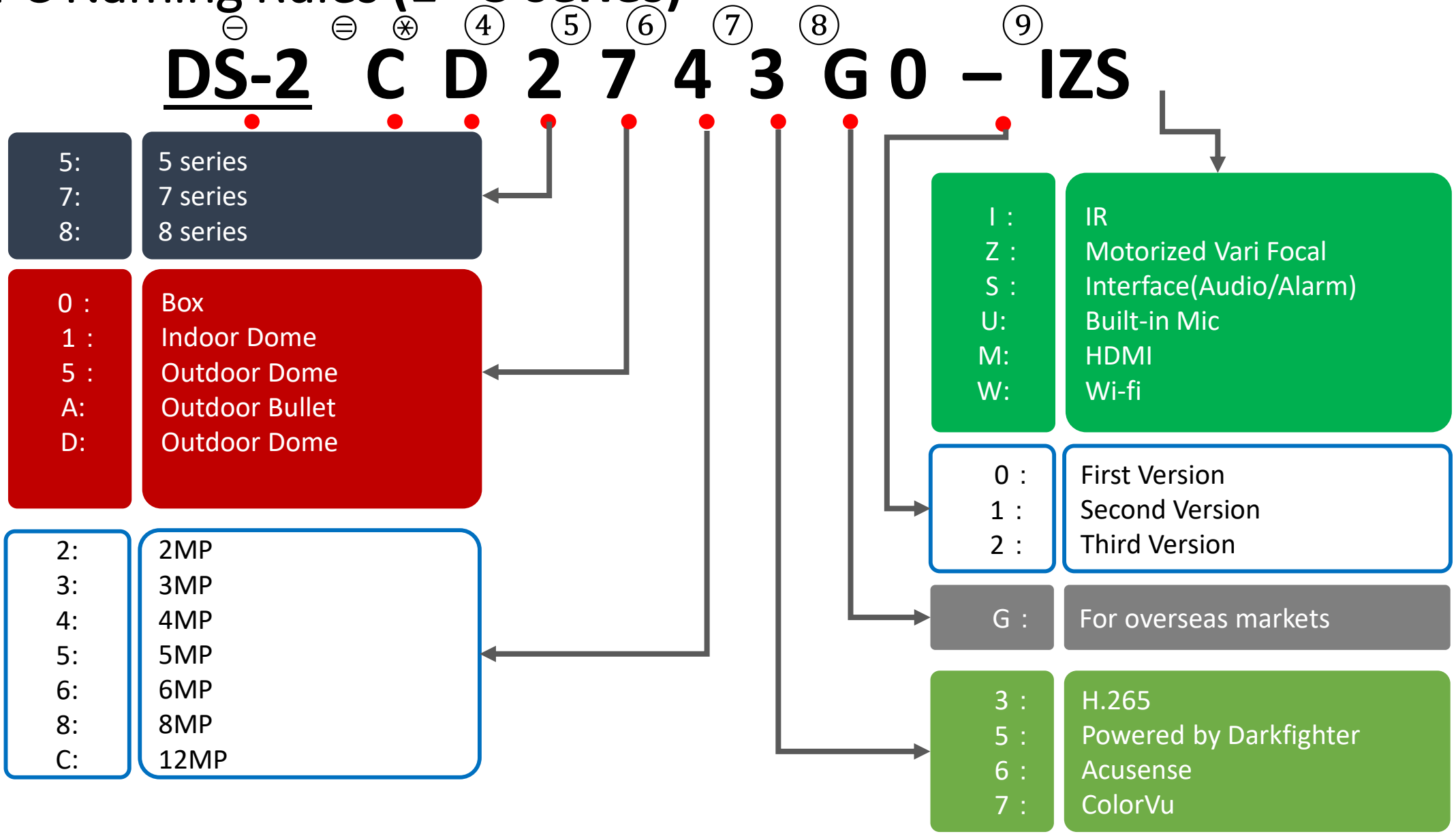
Hikvision Certified Security Associate

Contents

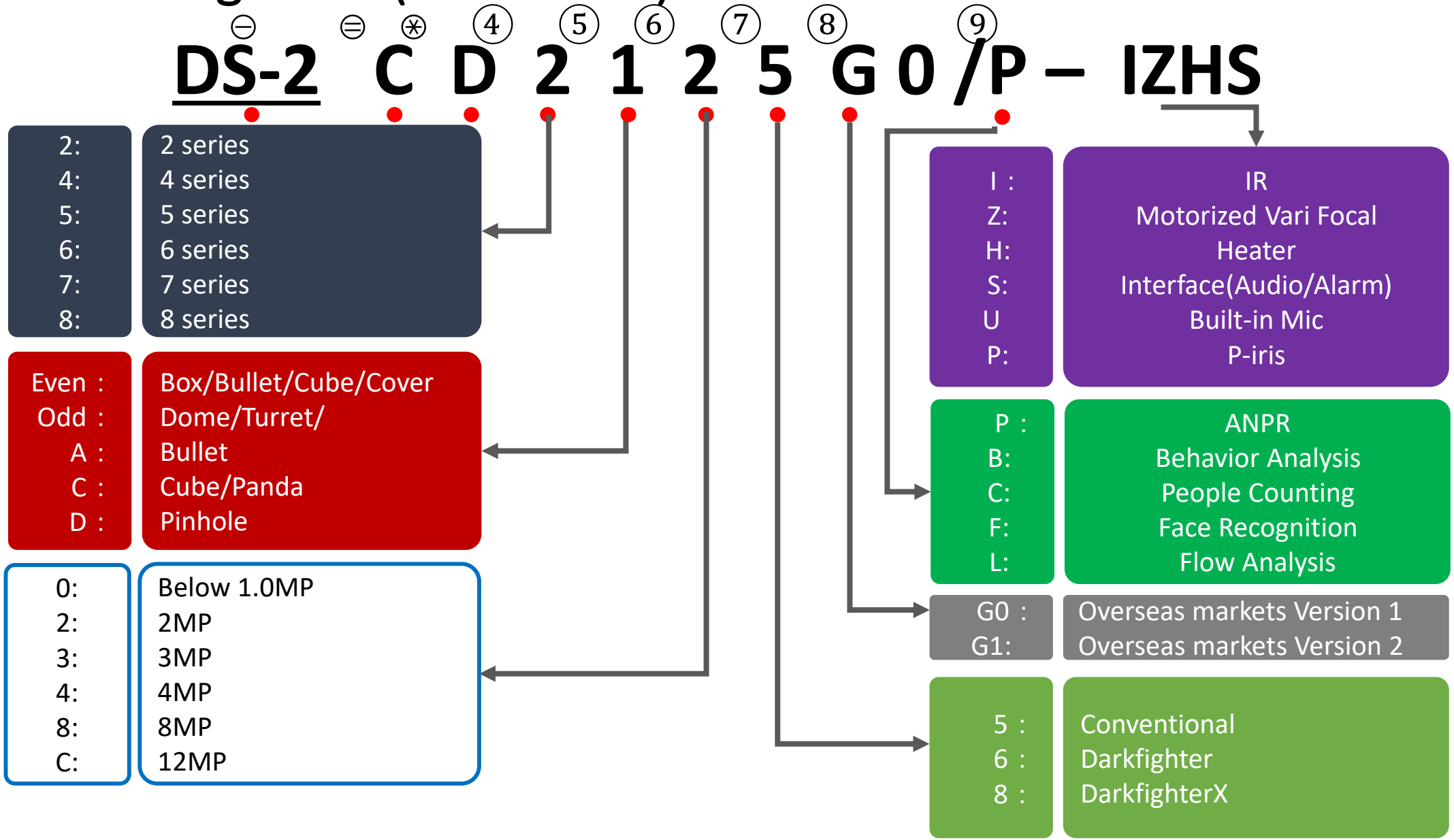
IPC Products Family



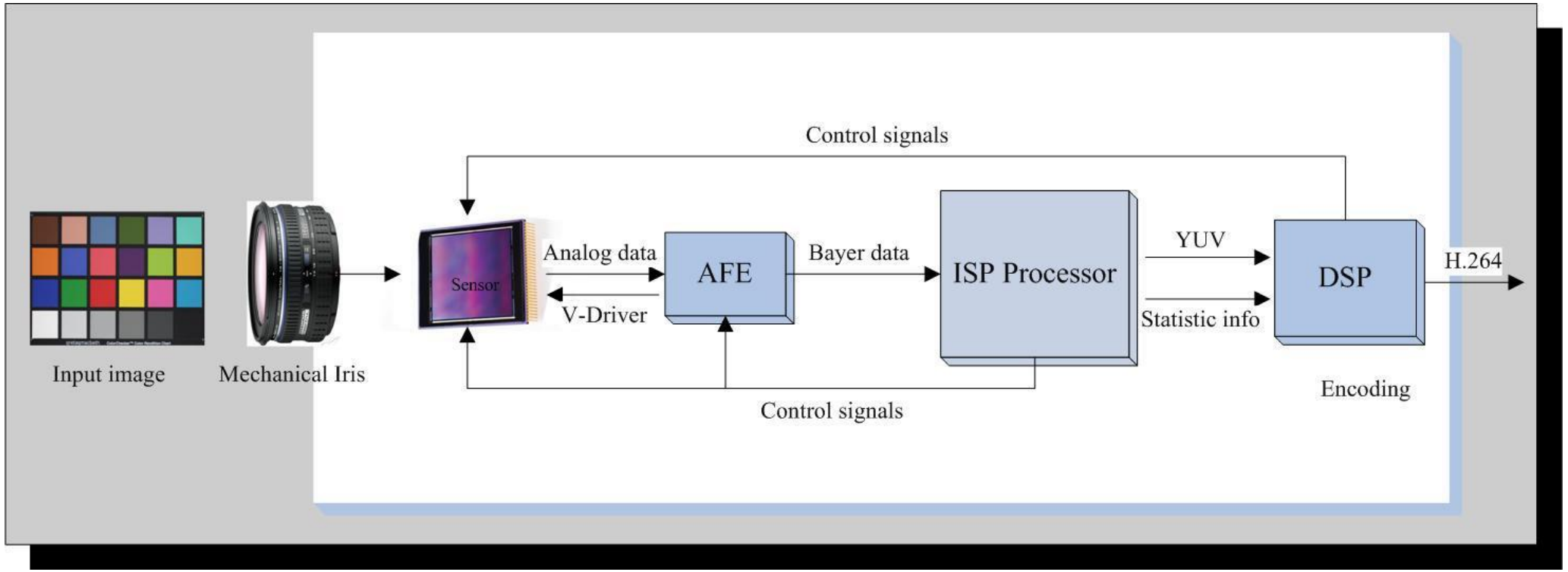
IPC Naming Rules (1 - 3 series)



IPC Naming Rules (4 - 8 series)



Working Principle



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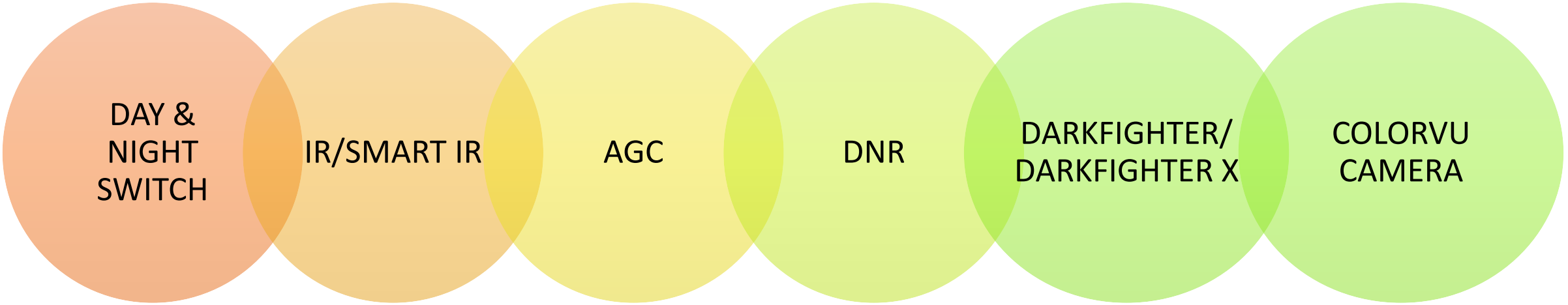
Low Light Features

How to achieve a good and clear image at night?



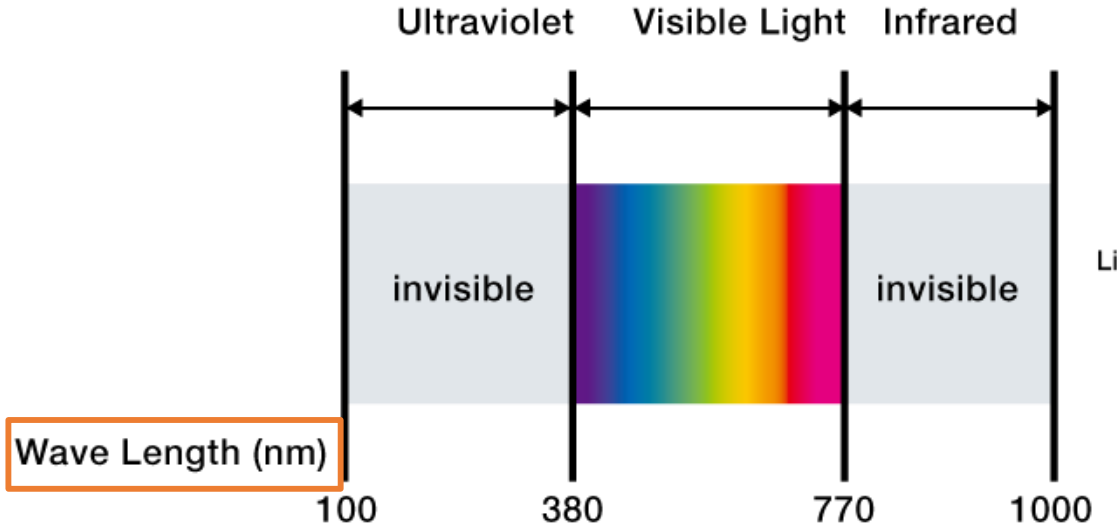
Day & Night Switch

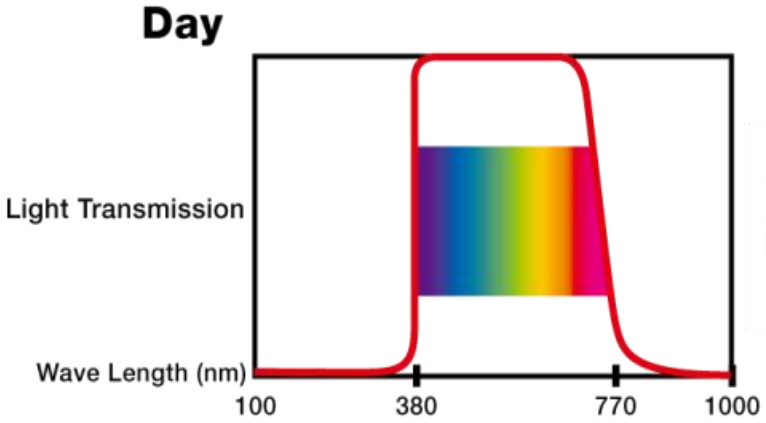
At night or under low illumination scenes, the camera switch from **color mode** to **B/W** mode automatically, which can improve low-light performance effectively.

Day (color) mode

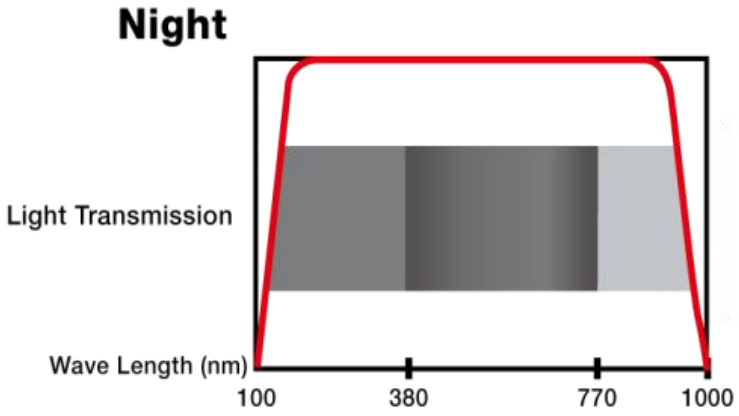
Night (black and white) mode

ICR (IR-Cut Filter Removable)

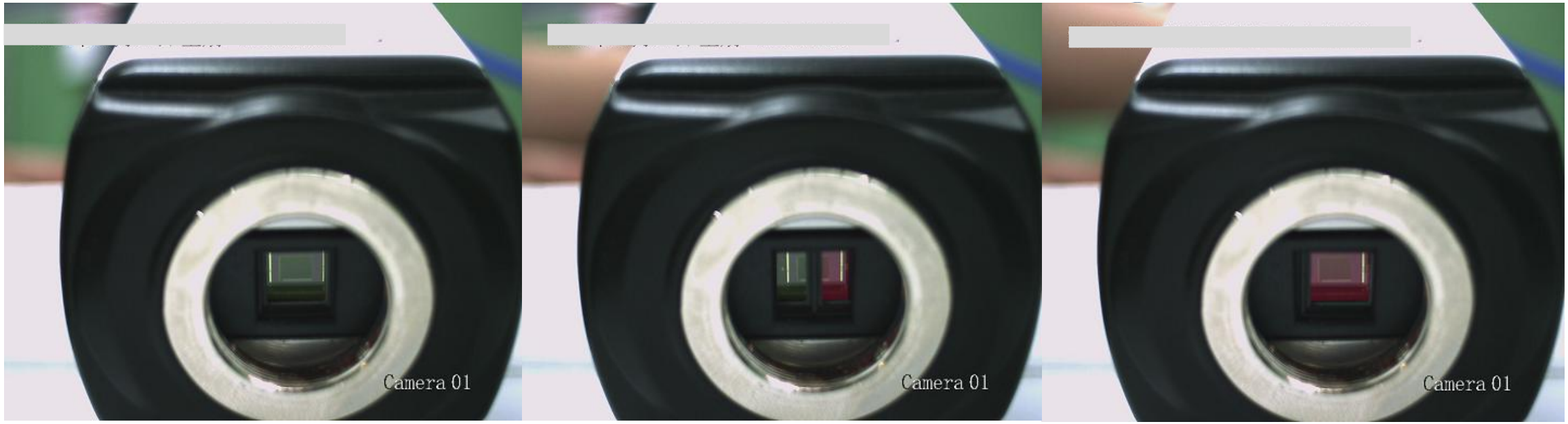




How ?

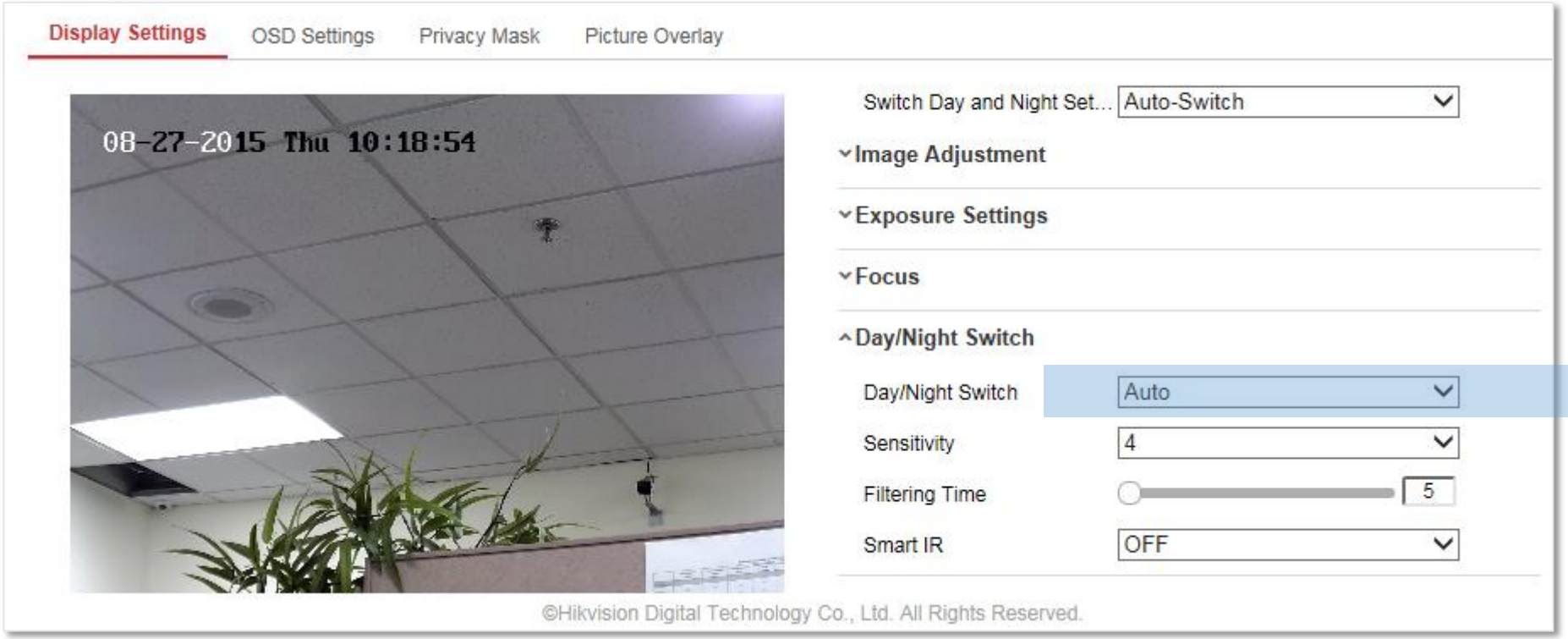


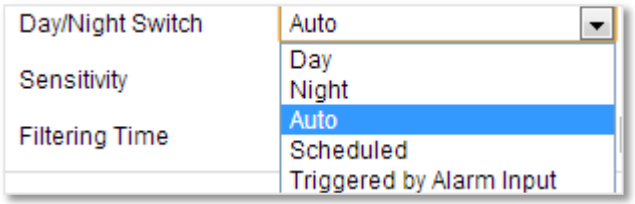
ICR (IR-Cut Filter Removable)



Day & Night Switch Configuration

Configuration > Advanced Configuration> Image> Display Settings





NOTE

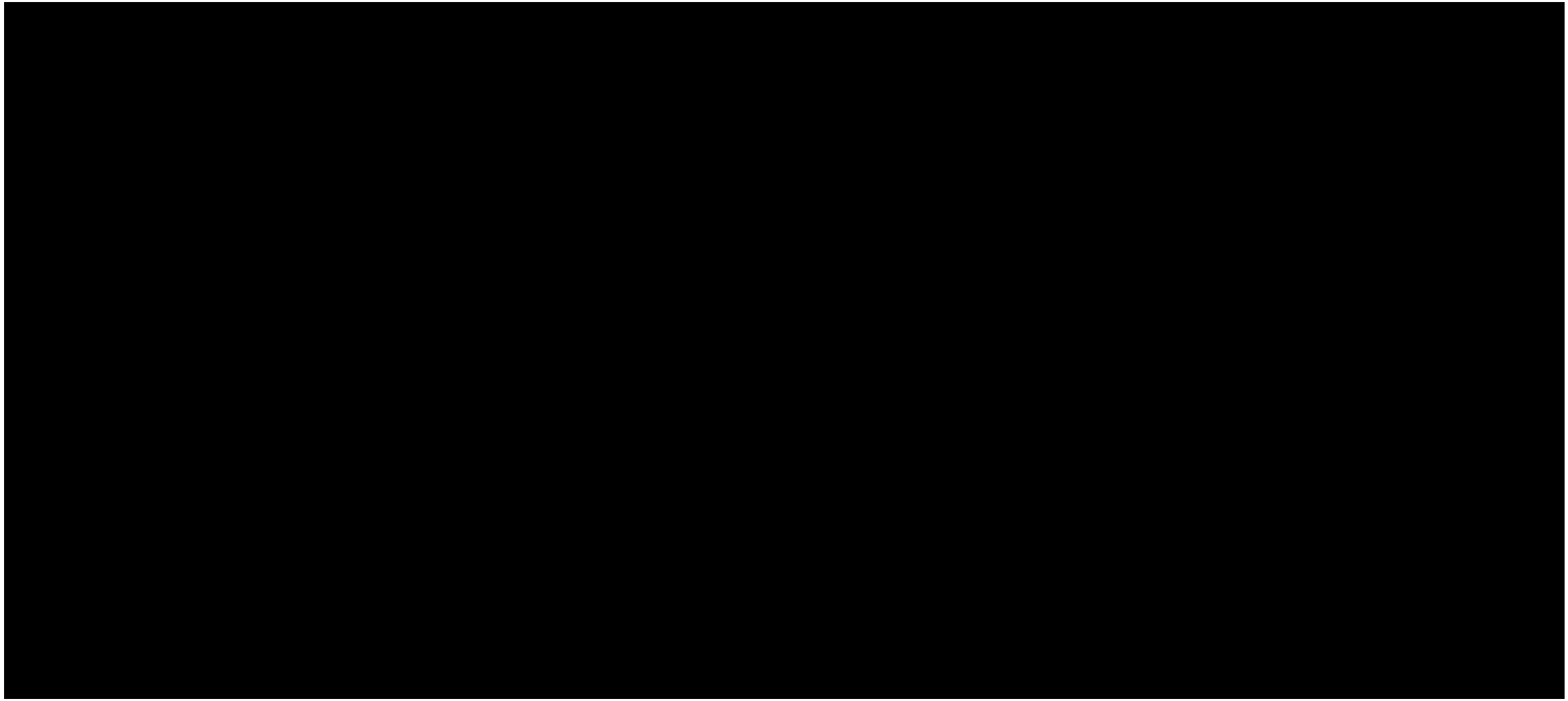
Day, night, auto, schedule, and triggered by alarm input are selectable for day/night switch.

Day & Night Switch

Color & B/W Switch	Day, Night, Auto, Scheduled, Alarm Triggered	Multiple mode
Sensitivity	0~7	Judged by image brightness & gain
Filtering Time (s)	5~120	After this period of time, the color & B/W mode switch
Smart IR	ON/OFF	Prevent overexposure

Day: the camera stays at day mode.
Night: the camera stays at night mode.
Auto: the camera switches between the day mode and the night mode according to the illumination automatically. The sensitivity ranges from 0~7, the higher the value is, the easier the mode switches. The filtering time refers to the interval time between the day/night switch. You can set it from 5s to 120s.
Schedule: Set the start time and the end time to define the duration for day/night mode.
Triggered by alarm input: The switch is triggered by alarm input, and you can set the triggered mode to day or night.

Low light or completely dark situation

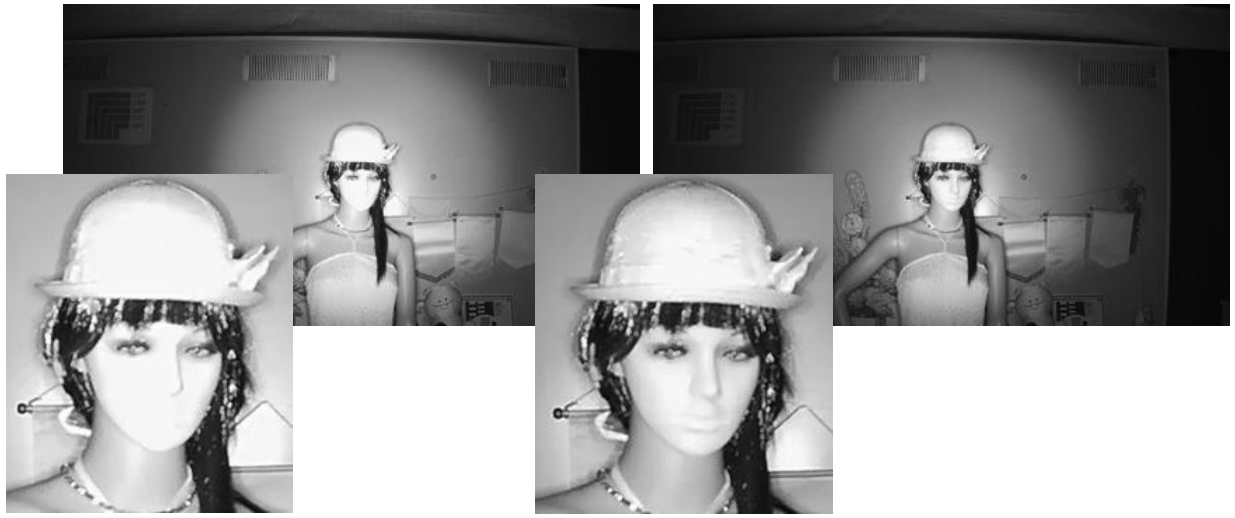


Low light or completely dark situation

Smart IR

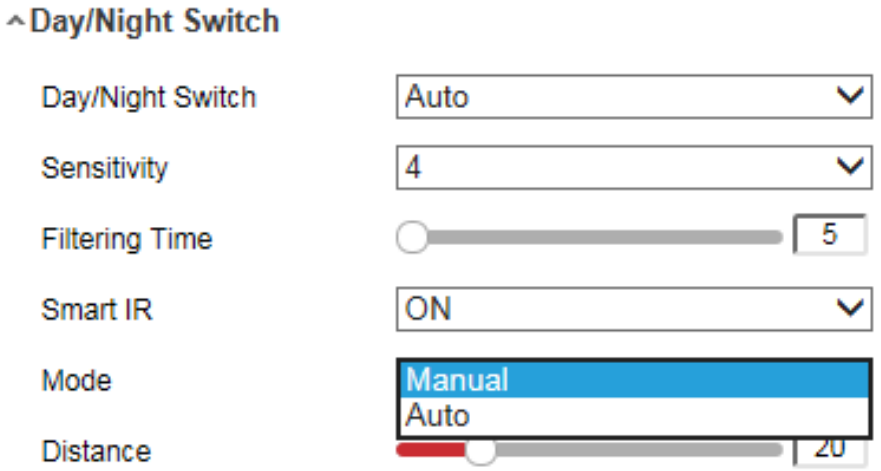
Smart IR function gives user an option to adjust the power of the IR LED, thus providing a clear image that is not overexposed or too dark.

Anti Over Exposure



Smart IR off

Smart IR on



Manual mode: Configure the distance by control the current intensity of the led

Auto mode: Auto-adjust the current intensity of the IR led

AGC

- AGC(**Auto Gain Control**) amplify the signal from CCD to make it brighter during night time. This amplification is called gain. The camera can auto adjust the gain control according to signal level.
- Advance: increase dynamic range;
- Disadvantage: amplify noise as well.

AGC Off AGC On

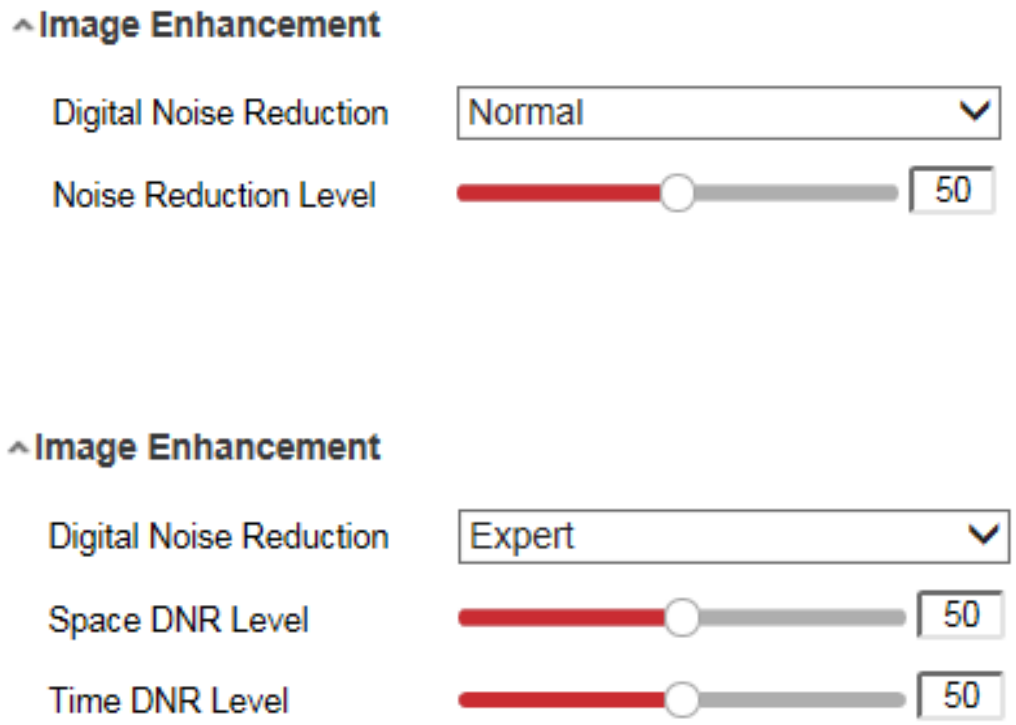
DNR

- Through DNR function we can reduce the noise to get a better quality image during **night**.
- Hikvision cameras adopt **3D digital noise reduction** to provide images with less noise in low-light surveillance scenes compared to conventional cameras. 3D DNR can be used to enhance image quality and save bandwidth.

DNR Disabled

DNR Enabled

DNR



- 3D DNR (EXPERT MODE)
  - Space domain->static noise, vague
  - Time domain –> inter-frame noise reduction - dynamic noise, moving image trail

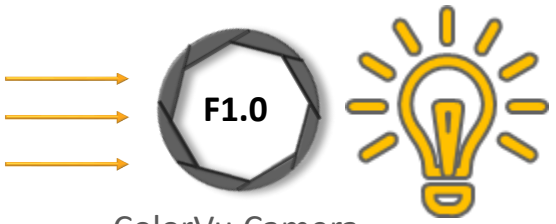
ColorVu

Bright and Colorful Image

1.Large Aperture

F1.0 super aperture
More light and brighter images

Conventional Camera



ColorVu Camera

4X amount of light of conventional camera

2.Advanced Sensor

Higher utilization of light,
more light enter sensor
(4 MP 1/1.8” Sensor)

3.Warm-light, not dazzling

Traffic camera light

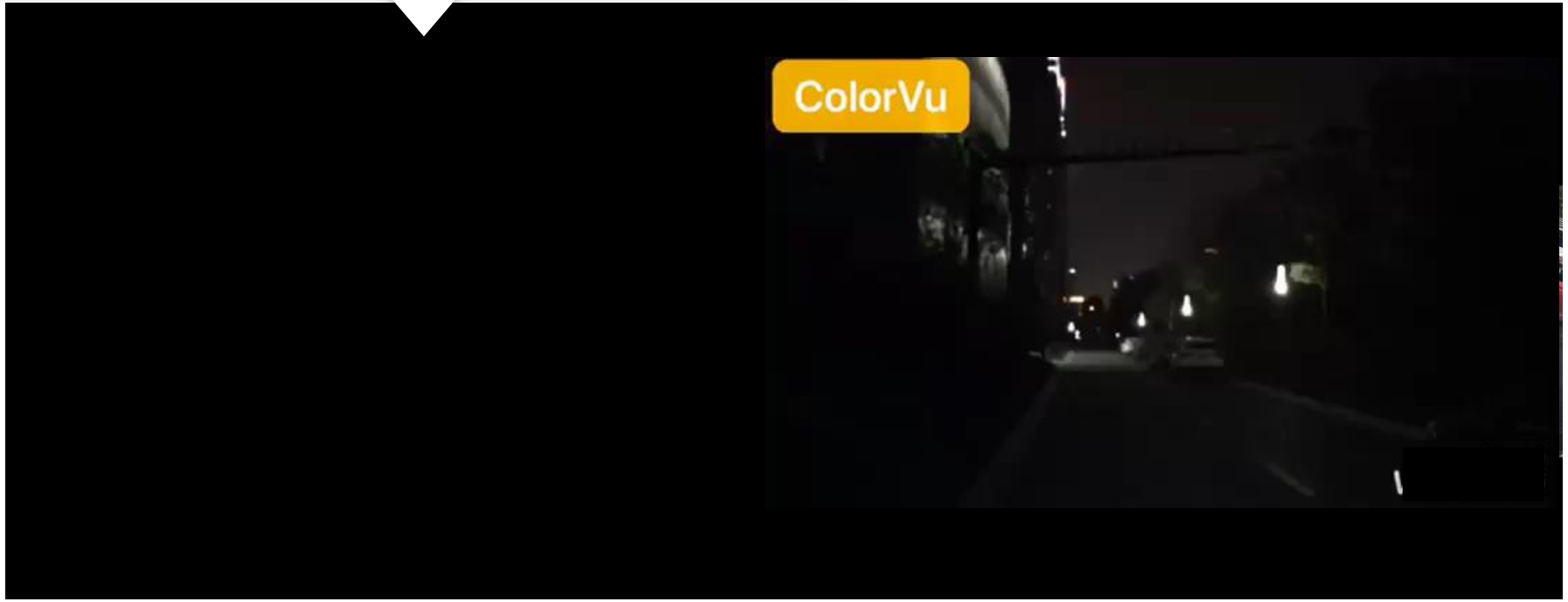
Warm-light
ColorVu Camera2

ColorVu

Recommended

DS-2CD2347G1-L(U)
DS-2CD2327G1-L(U)

DS-2CD2T47G1-L
DS-2CD2T27G1-L



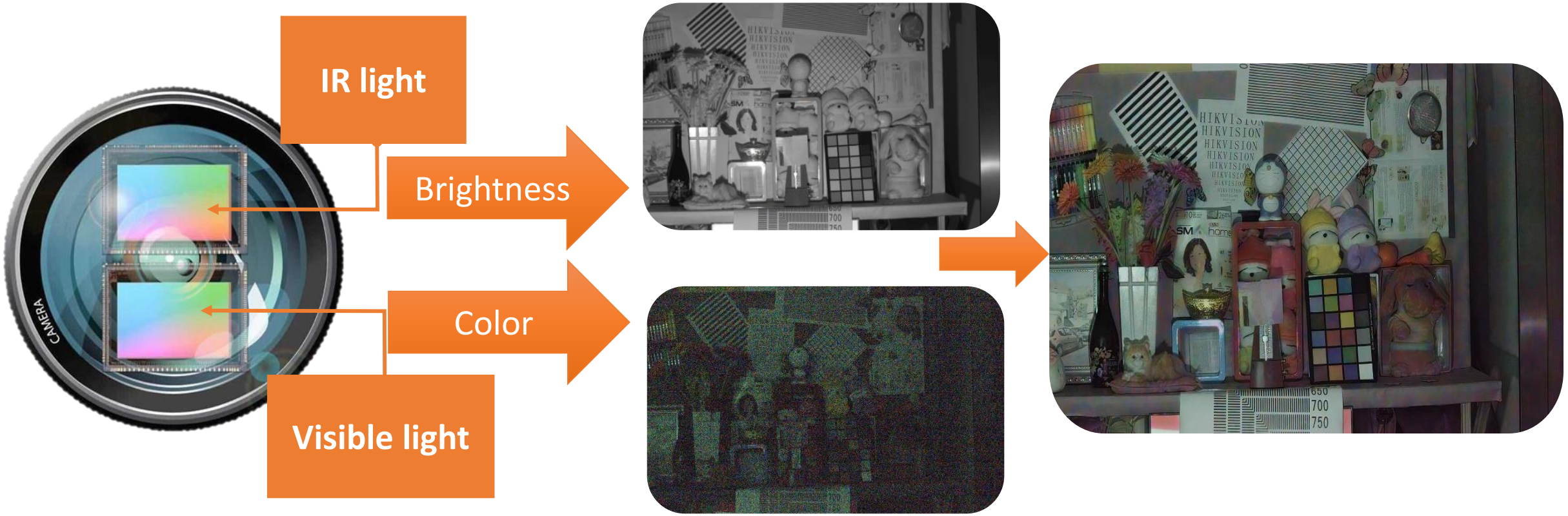
Darkfighter

- Darkfighter adopts the **most advanced CMOS sensor**, with the optimized **3D DNR algorithm**.
- The minimum illumination in color mode is 0.002Lux.

Darkfighter **Conventional Camera**

DarkFighter X – Dual Sensors

- **DarkfighterX** has innovative dual sensors design, one sensor for IR that guarantees the image brightness, the other one for visible light that guarantees chroma.
- Two images will be combined to form different spectra into **One Full Color** image.



DarkFighter X – Image Comparison

DarkFighter X

iPhone 7

Traditional Camera

DarkFighter Camera

DarkFighter X Camera

Successful Case

Tower surveillance

Real performance at 10:25 pm midnight

Background: xx city wants to achieve panoramic surveillance by taking advantage of the communication tower.

Installment: 40 meters above ground on the tower

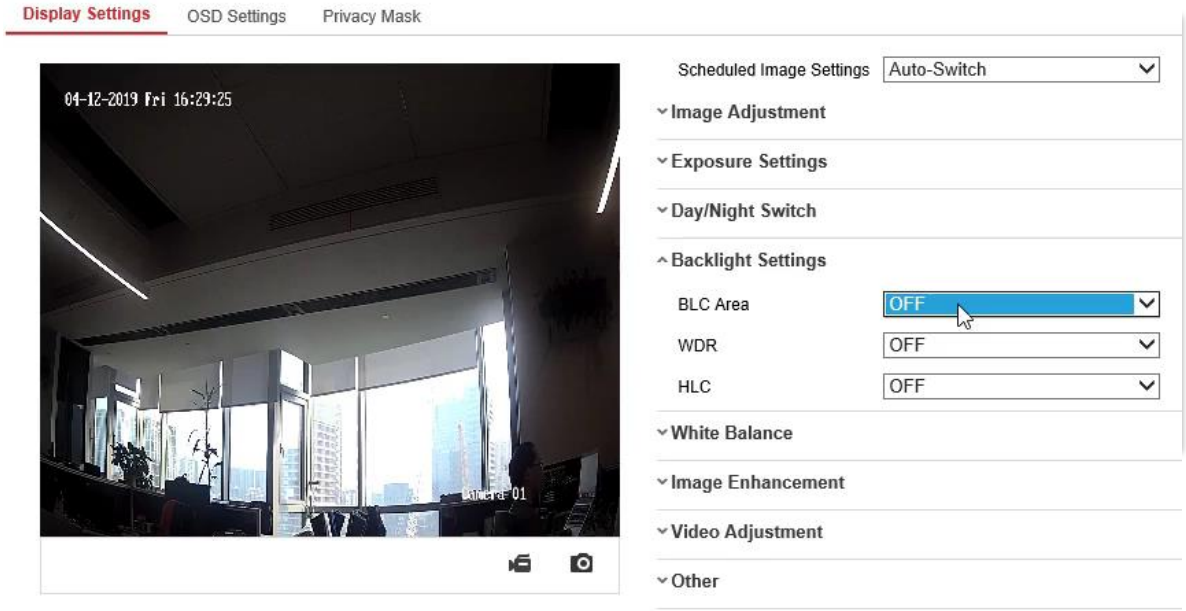
Customer Value:

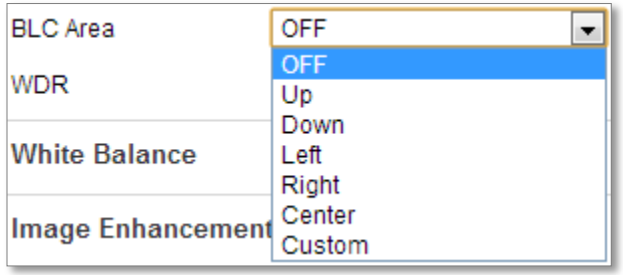
1. Cover 3-4 kilometers area with 35x optical zoom to check details
2. Provide clearly colorful image on dimly-lit condition
3. High altitude patrol for incidents, such as fire, flooding, etc.

Contents

BLC (Back Light Compensation)

- **BLC:** When you monitor objects against strong backlight, the objects are usually too dark. BLC compensates light to the object in the front to make it clear.
- It enables objects in the foreground to be seen clearly, although the background areas will be changed.





NOTE

OFF, Up, Down, Left, Right, Center and customize are selectable.

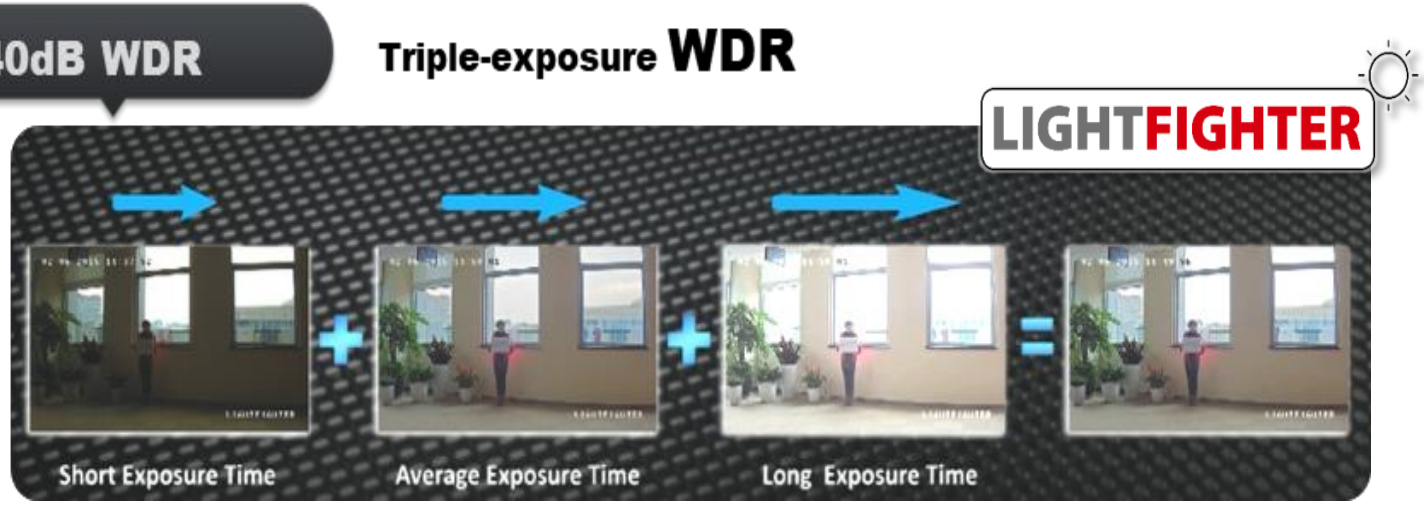
WDR (Wide Dynamic Range)

- **WDR**: WDR cameras often incorporate an image sensor that takes different exposures of a scene (e.g., a short exposure for very bright areas and long exposure for dark areas) and combine them into one image, **enabling objects in both bright and dark areas of a scene to be visible**.

120dB WDR

Enable WDR may reduce the image quality (image looks grey) in normal situation.

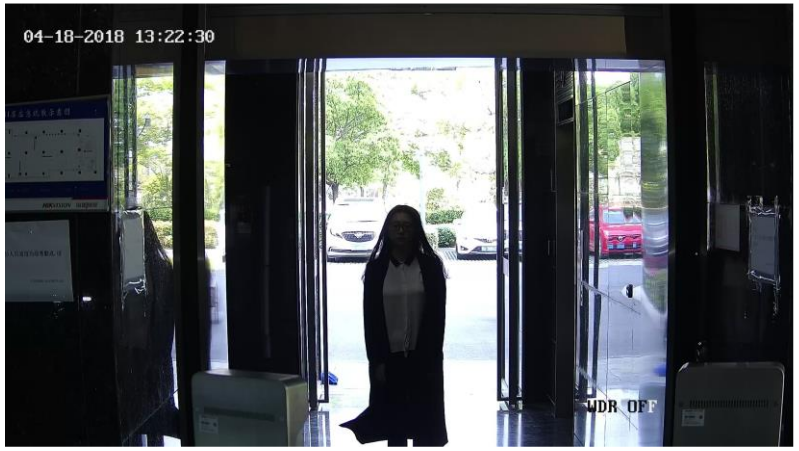
140dB WDR



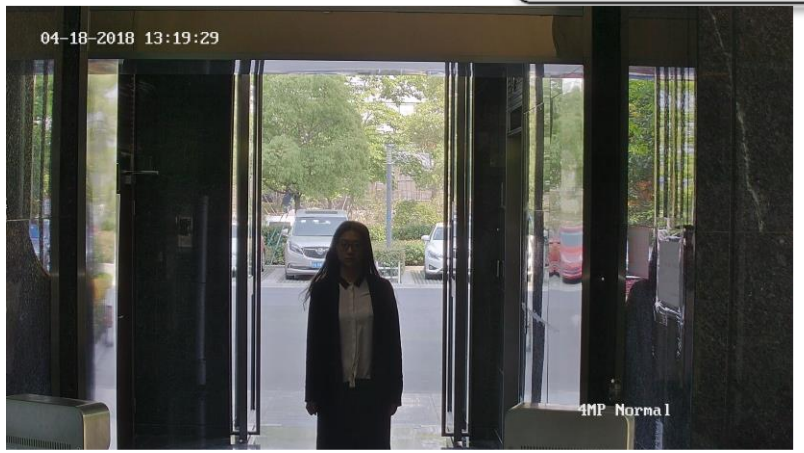
Ultra IP Camera

5 Series

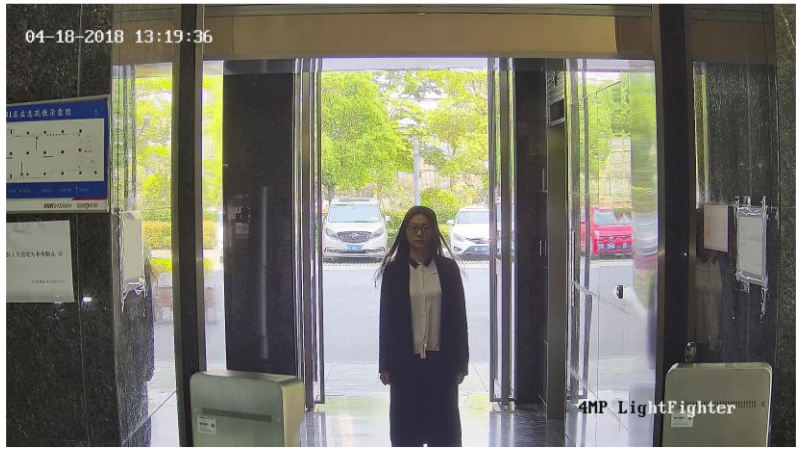
LightFighter



▲ 4 MP Normal WDR Off



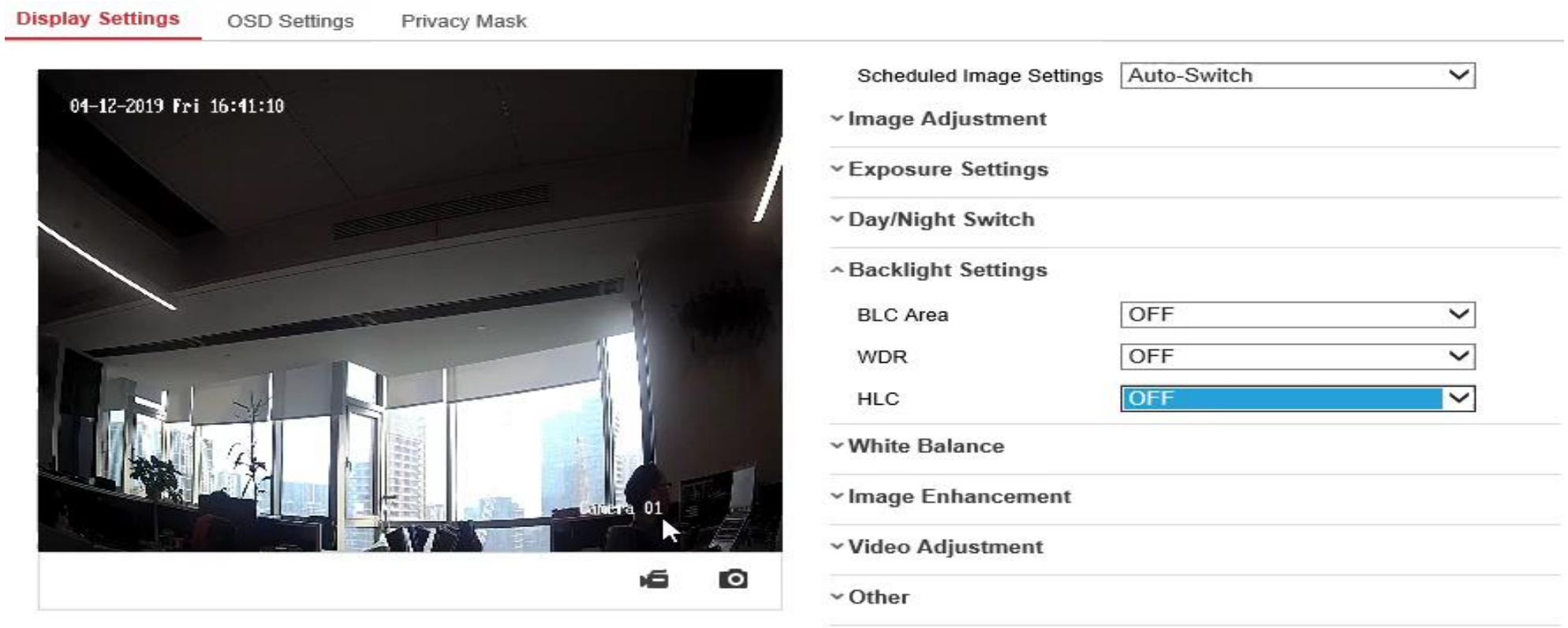
▲ 4 MP Normal WDR On



▲ 4 MP **LightFighter** WDR On

HLC (High Light Compensation)

- Compensate the strong light in the picture, so that the surrounding area wouldn’t be over-exposed and still could be seen.
- Widely used in traffic monitoring, where license plates must be recognized.



WDR vs. BLC vs. HLC

	WDR	BLC	HLC
Core technology	Circuit module & algorithm	Algorithm	Algorithm
Advantage	Twice or triple exposures	Areas are selectable	/
Disadvantage	Consume CPU	Background may be overexposed	/

Origin

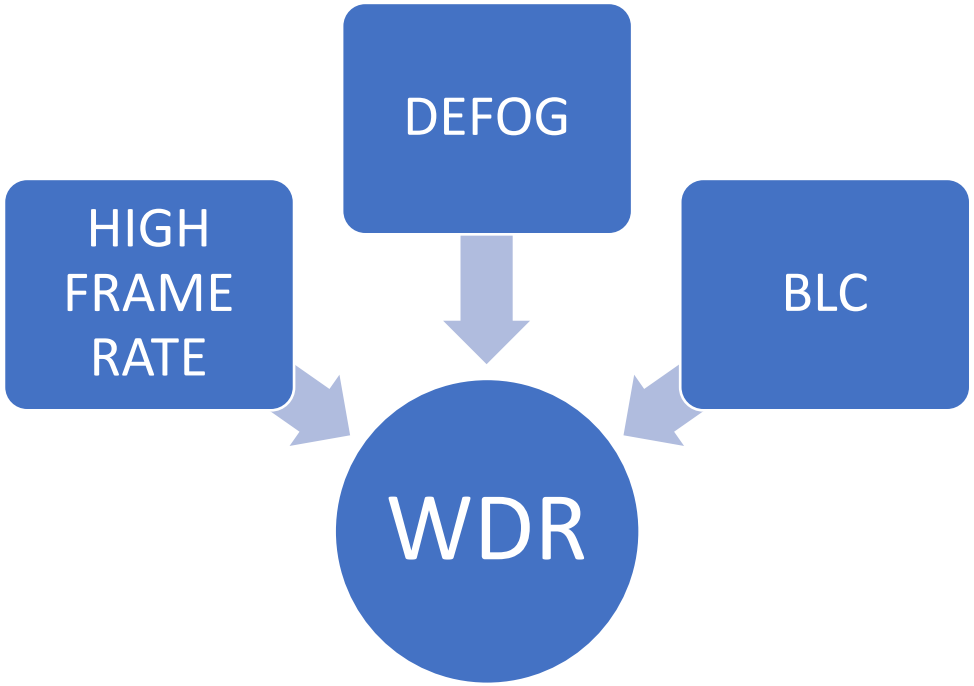
BLC

WDR

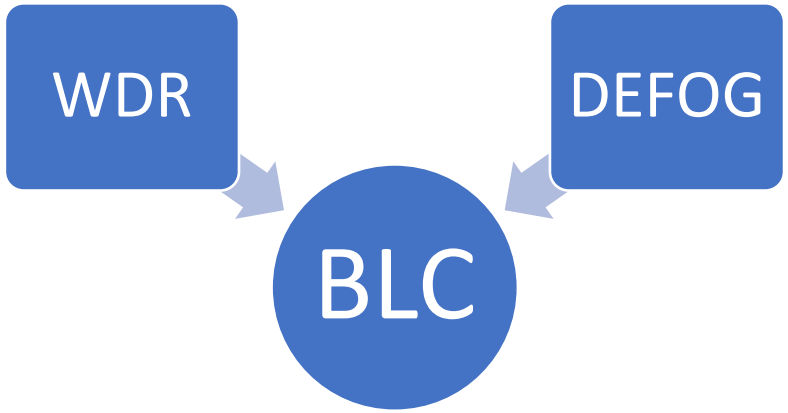
NOTE

✓ Users should choose the mode appropriately according to the real scene to form the optimal image.

WDR vs. BLC vs. HLC



For Hikvision cameras, WDR are conflicted with high frame rate, defog and BLC function. They cannot be enabled at the same time.



For Hikvision cameras, BLC is conflict with WDR and defog function. They cannot be enabled at the same time.

Contents

Fast Moving Objects

- Use **high frame rate** camera in the condition that the bitrate is enough, such as **4XXXFWD** camera.
- **Decrease the exposure time** to reduce the tailing.
  - For less than or equal to 70km/h vehicle speed, we recommend 1/200s or 1/250s exposure time.
- To see the vehicle clearly **at night**, **lower the contrast** and set the **3D DNR** to 20~30 or even lower.
- **Disable WDR** to reduce tailing.

Frame Rate Comparison

Exposure time

- Exposure time usually be set between 1/50 – 1/100,000 second.
- Long exposure time is suitable for dark scene, but moving objects may have trailing problem.
- Short exposure time is suitable for dynamic scene, while the image may be dark.

1/50s

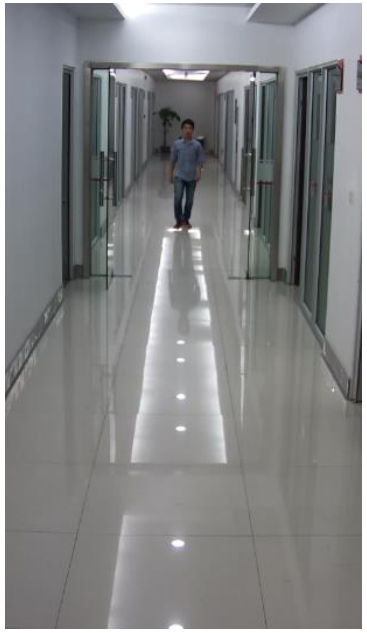
1/500s

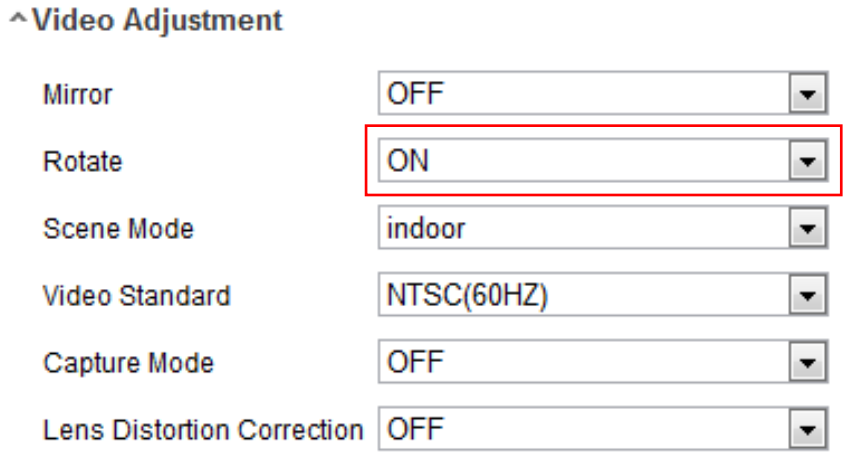
Contents

Rotate mode

- **Rotate**
  - To make a complete use of the 16:9 aspect ratio, you can enable the rotate function when you use the camera in a narrow view scene.
  - When installing, turn the camera to the 90 degrees or rotate the 3-axis lens to 90 degrees, and set the rotate mode as on, you will get a normal view of the scene with 9:16 aspect ratio.

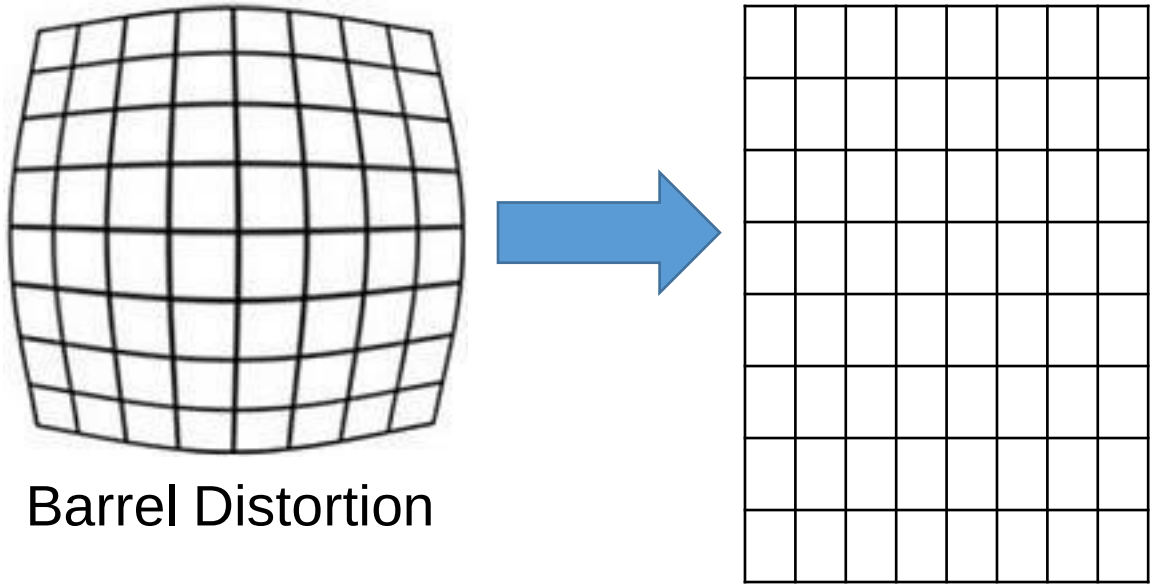
Rotate mode on



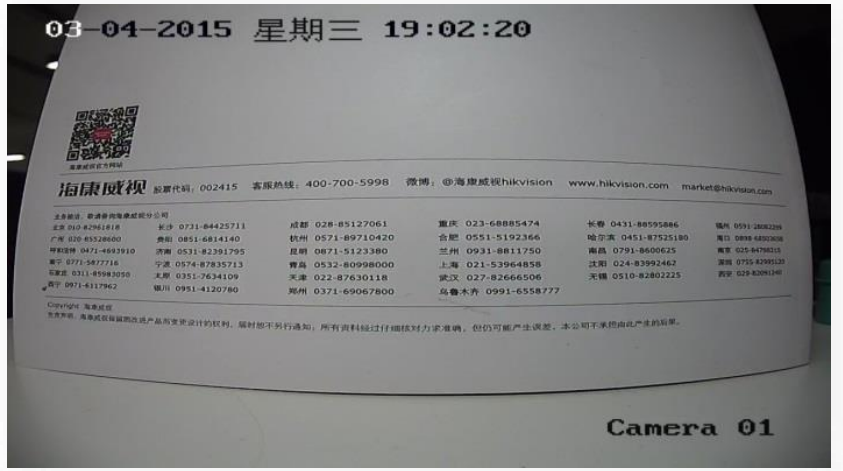


Lens Distortion Correction

- Some of Hikvision cameras support lens distortion function.



Barrel Distortion

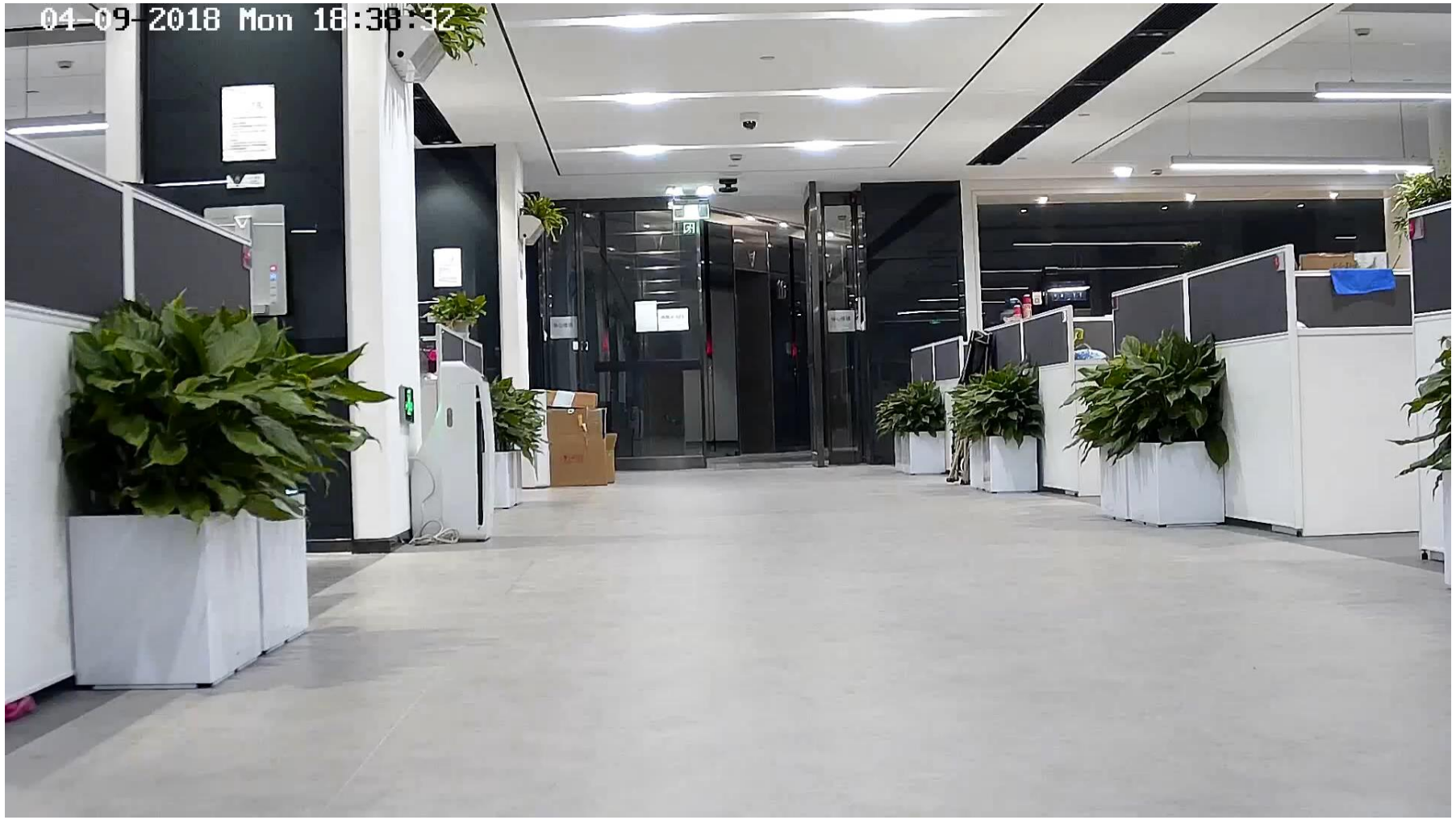


NOTE

- ✓ All lenses have distortion
- ✓ If the original image is OK, do not enable distortion correction

Hikvision 2nd Generation lens

Rapid auto focus



Hikvision 2nd Generation lens

Blue Glass

When camera is facing strong light source, halo would appear. Blue glass reduces the halo thus making image more clear.

Hikvision 2nd Generation lens

When the bubble is adhered with dust and water, the reflected IR will make image blurred.

The new generation bubble guarantees the image quality while supporting IK10.

Foggy Climate

- By modeling the imaging features of smoke, dust, fog, etc., defog technology effectively restores details and color to obtain accurate and natural video. Defog technology helps maintain clarity in images captured in poor weather conditions such as smog, or fog.

Defog OFF

Defog ON

Contents

Bandwidth and Storage Calculations

What factors will affect the bandwidth and storage space?

It depends on the following factors:

- **Video compression type**: H.264, MPEG-4, Motion JPEG, H.264+, H.265
- **Scene**: Image complexity (e.g., gray wall or a forest), lighting conditions and amount of motion (e.g., office environment or crowded train stations)
- **Image resolution**
- **Frame rate** (Frames per second)
- **I-frame interval**
- **Number of cameras will be recorded**
- ……

H.265+

Based on the current H.265 standard, Hikvision analyzed and optimized the encoding, and developed H.265+ that reduces the bandwidth and storage requirements.

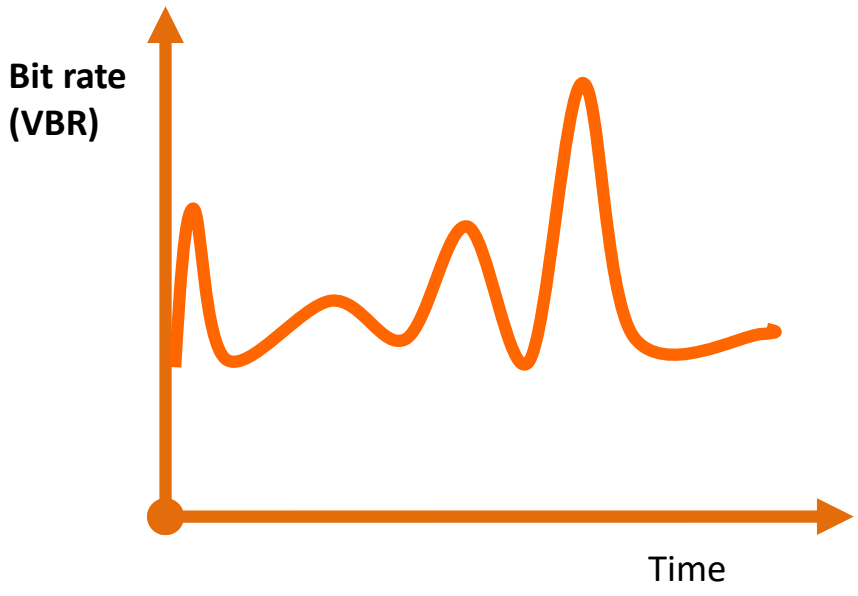
General Surveillance Scenario Features

1. **Fixed camera with few background changes**
2. **No frequent moving objects**
3. **Moving objects are the interesting monitor targets**
4. **24/7 surveillance video, easily affected by image noise**

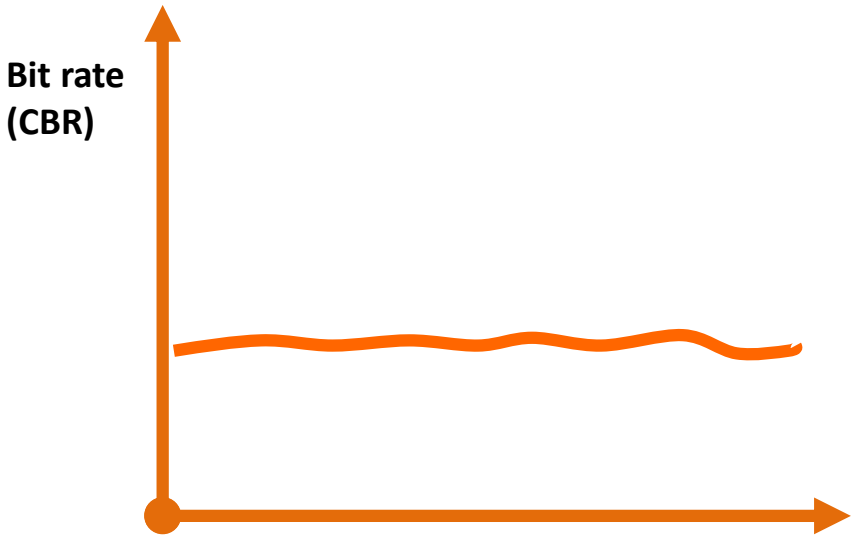
Different surveillance scenarios	Bandwidth/storage space comparison between H.265+ and H.265
Fixed Scene with few moving objects	H.265+ saves 75%
Fixed scene with many moving objects in a certain time period(not very frequently)	H.265+ saves 50%
Changing scenes with moving objects all the time	Nearly the same

VBR vs. CBR

- In Variable bit rate (VBR), the **image quality is constant but as a result, the bit rate is variable.**
  - It is suitable for the scene with different movements in different time.
  - Can't estimate an accurate bandwidth/storage consumption.



- In Constant bit rate (CBR), **the bit rate is constant but as a result, the image quality is variable.**
  - It is suitable for the scene with constant movement.
  - Can estimate an "average" bandwidth/storage consumption.



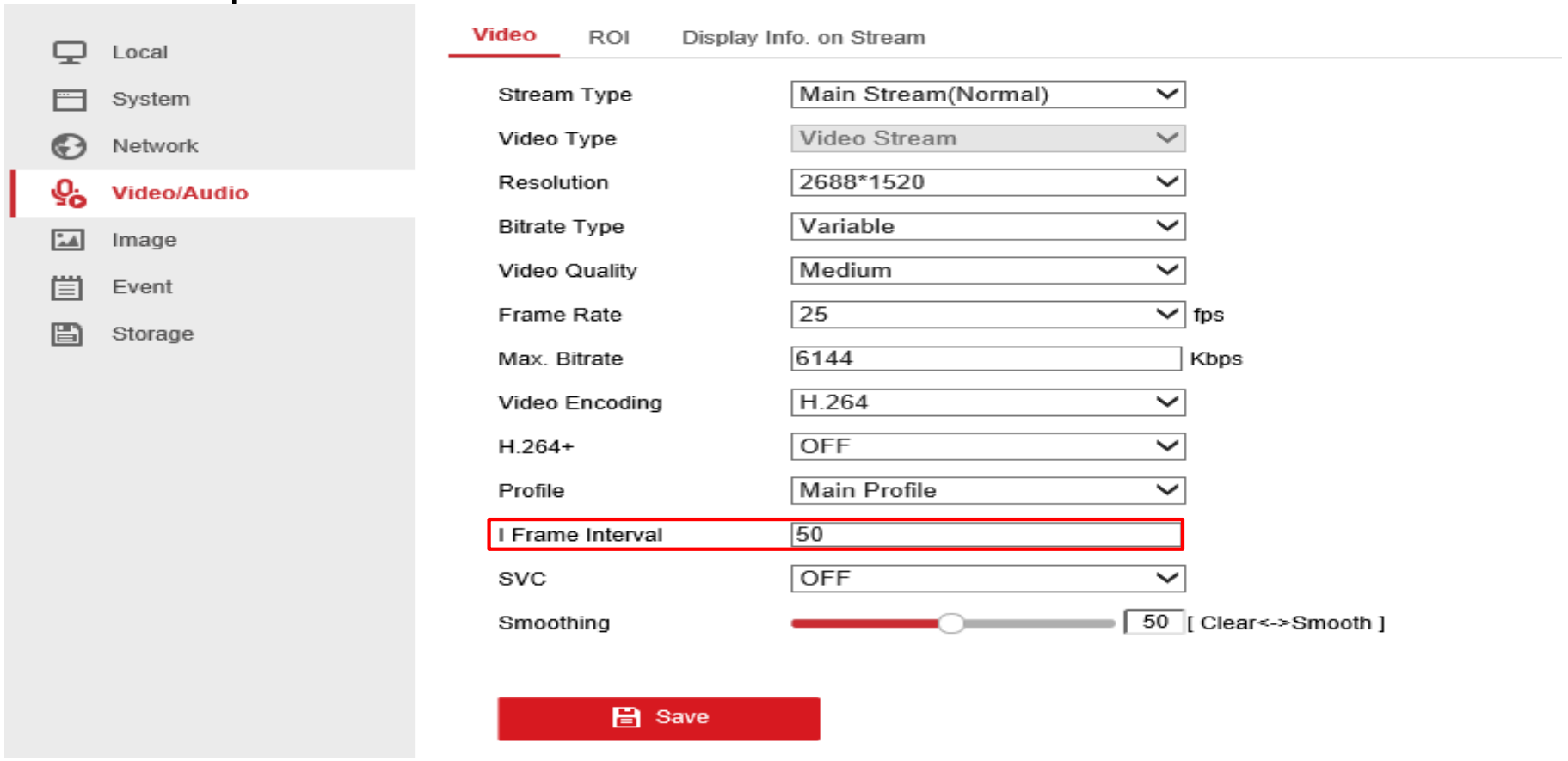
Calculation method:
storage space (MB/hour)= **bitrate (kbps)*60*60/8/1024**
(8:bit->byte, 1024: k->M)

Image Complexity

Complex images and more movements generate higher bit rates.

Frame Type

- **I-frame:** independently compressed; larger amount of data.
- **P-Frame**: difference from previous I or P frame
- **Intra-Frame Period** specifies the time between I-frames



Contents

Bandwidth Control

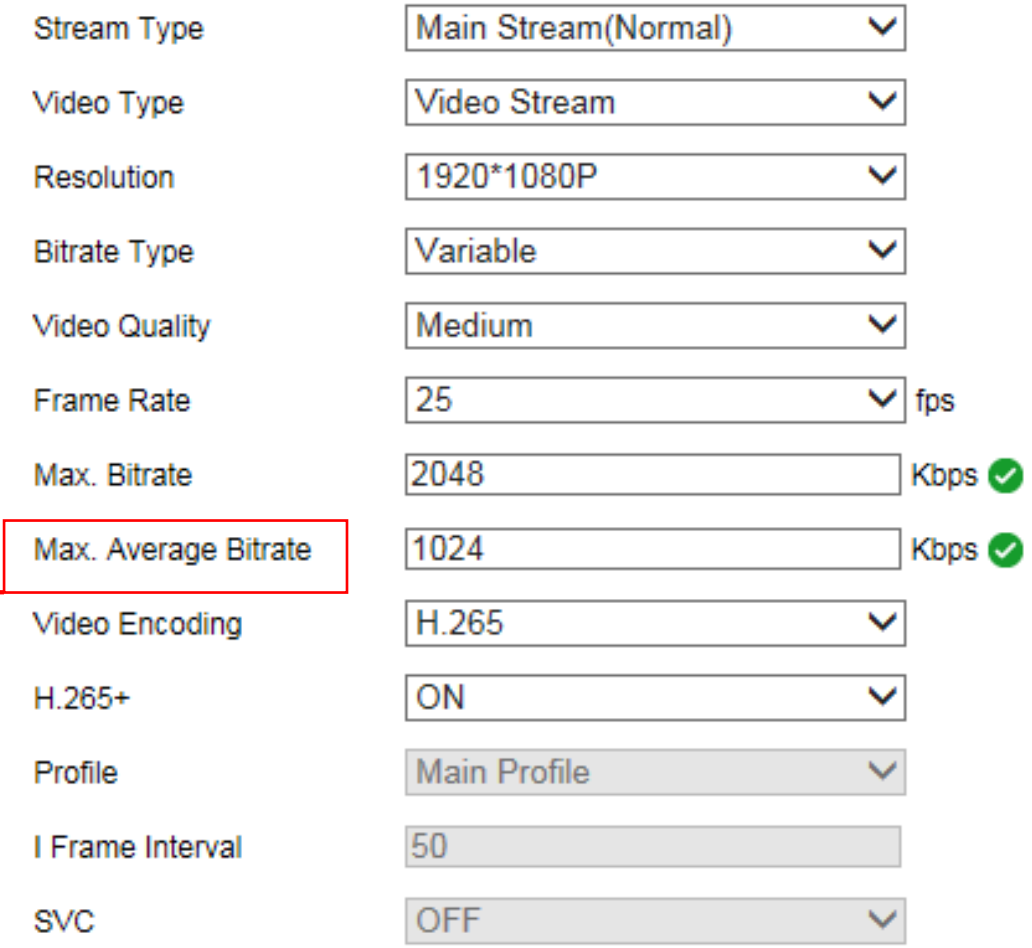
- Network video products utilize network bandwidth and storage space based on their configuration. Under **insufficient bandwidth**, we need to lower the bitrate in order to see the video.
  - Choose the right stream type
    - Main stream
    - Sub stream
    - Third stream
  - Set the lower resolution and frame rate if there is no enough bandwidth.

H.265+ Configuration

When H.265+ is enabled:

- Only variable bitrate type. The bitrate will be controlled by the algorithm to maintain the **long-term average bitrate**.
- I frame interval is auto-adjusted by algorithm.

- Third Stream, Stream Smoothing, ROI, Target Cropping, High Frame Rate are not available.



NOTE

Max. Average Bitrate is used to calculate the HDD space.

The Bitrate Revolution

Constant Bitrate

- Bitrate always stays at the max.
- Storage is calculated according to the maximum.

Variable Bitrate

- Bitrate changes with the scene, but is unpredictable.
- Storage **still** must be calculated according to the maximum.

Average Bitrate

- The bitrate changes with the scene, yet is predictable.
- The storage can be calculated according to the **average** bitrate.

Average bitrate
Controls the storage

ROI

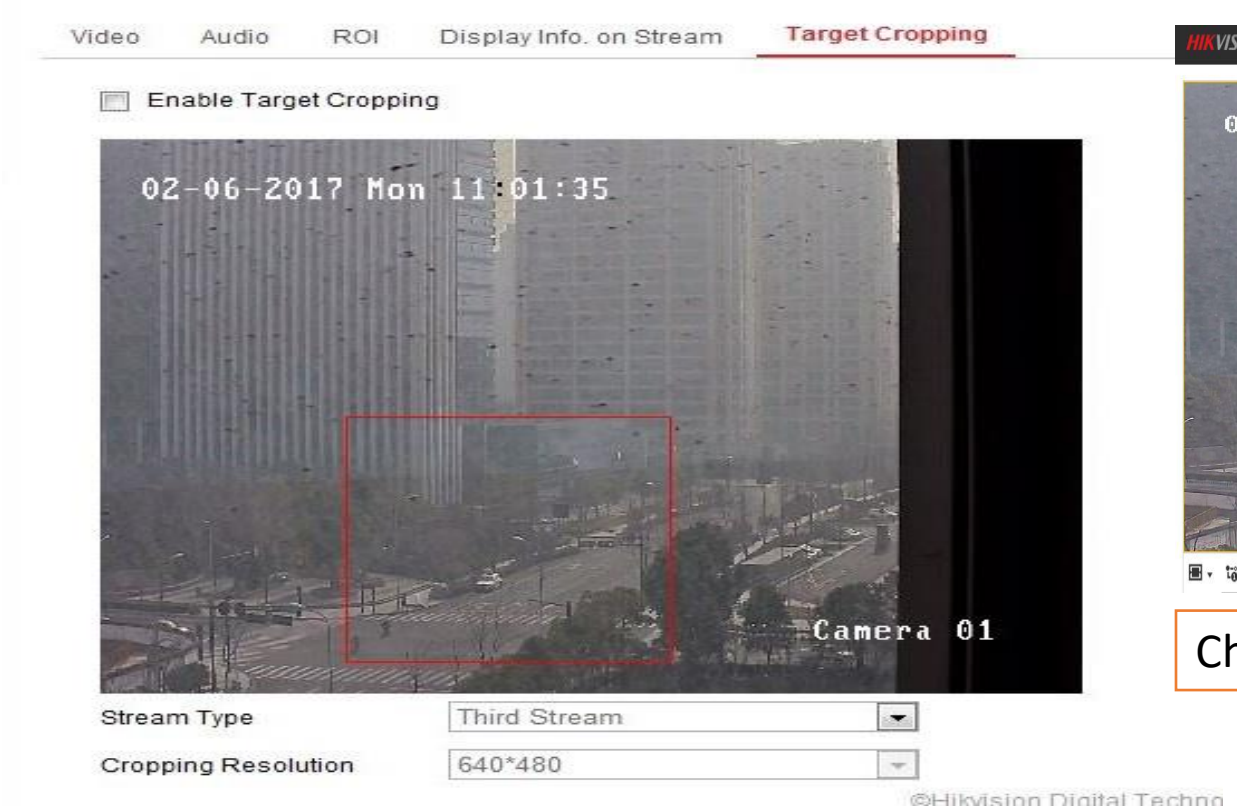
- ROI (Region of Interest) encoding helps to differentiate the ROI and background information in video compression, which assigns more encoding resource to the region of interest, thus to increase the quality of the ROI whereas the background quality goes down.

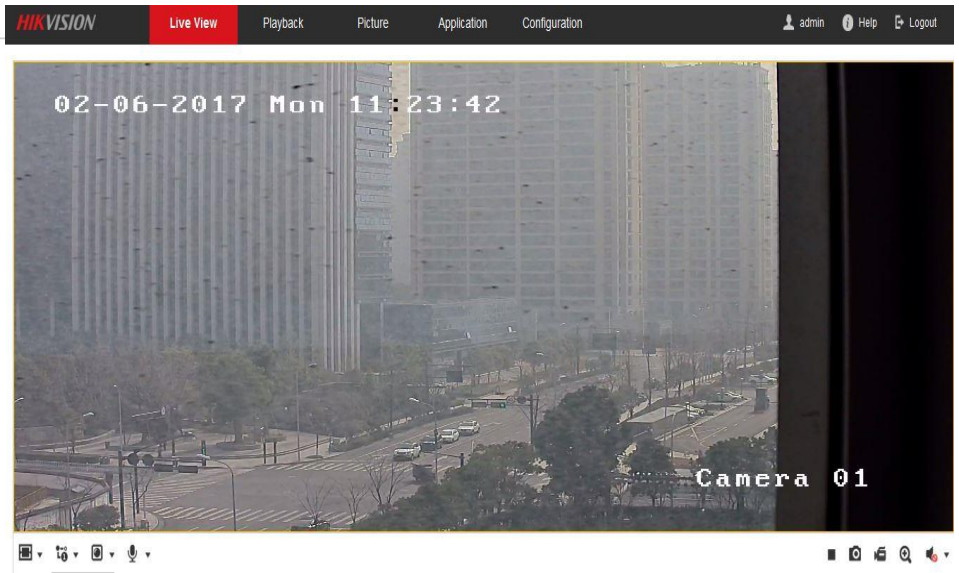
ROI Example

ROI Levels at Reduced Bandwidth

Target Cropping

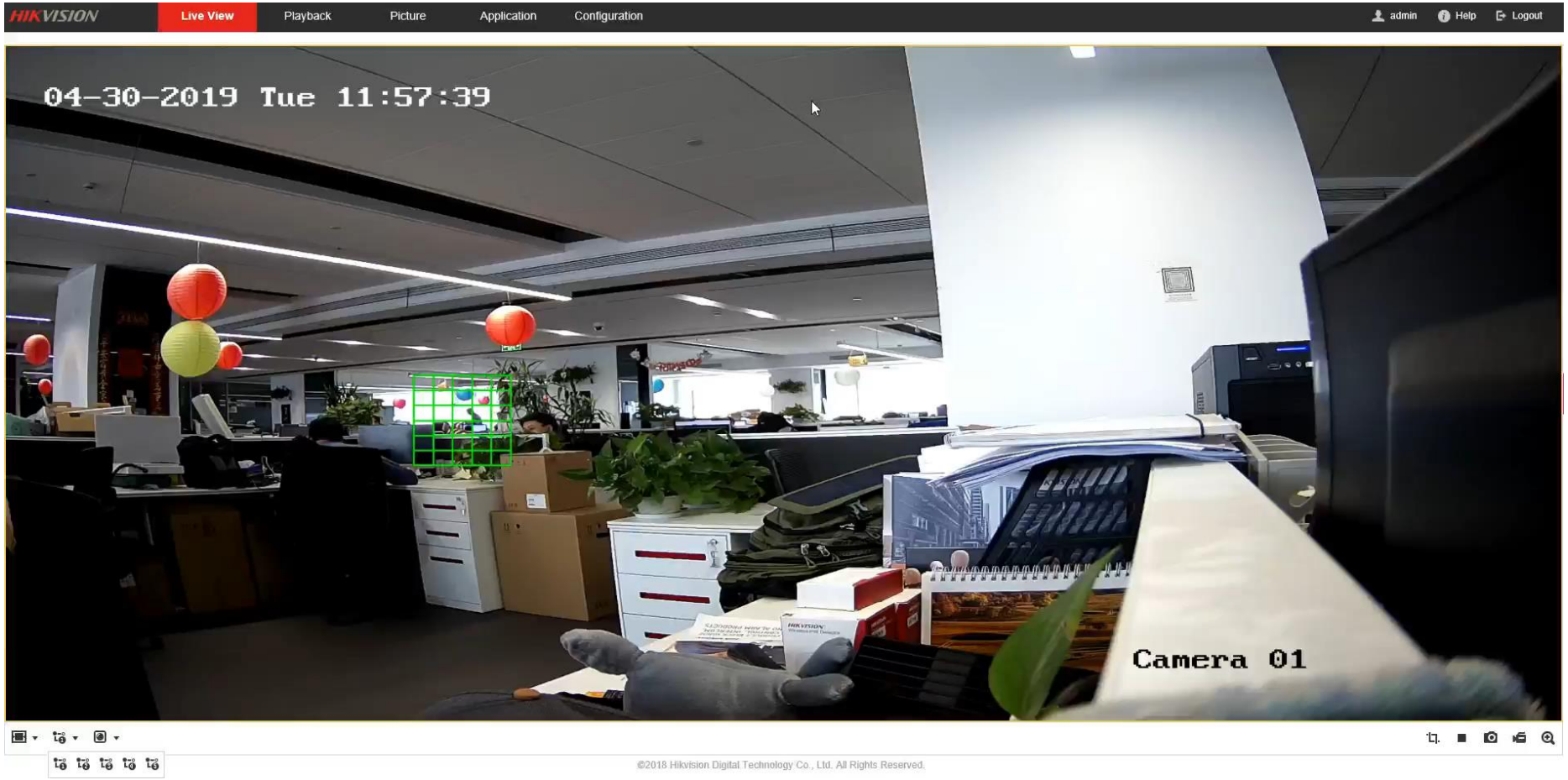
- You can specify a target area on the live video, and then it can be displayed via the **third stream** in some certain resolution, thus providing more details of the target area if needed.





Choose the third stream in live view

Target Cropping Example



Contents

Stream Type

- **5 defined streams + 5 custom streams**

All streams support H.265

Recording

Cellphone surveillance

Preview

MJPEG up to 2MP@30fps

Third party integration

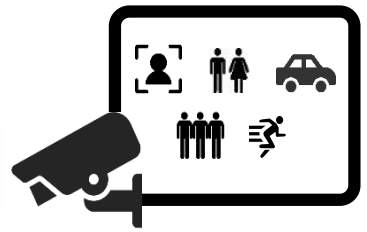
Why do you need HEOP?

Requirements

- To meet a variety of demands from different industry segmentations
- To acquire more algorithm and software supplier resources

What is Hikvision HEOP

Hikvision Embedded Open Platform is an open application platform that enables development of third party applications that can be downloaded and installed in Hikvision network cameras.



Application partners

It is possible for application partners to develop applications which are able to be installed in 5 Series cameras.

VMS Partners

It is possible for platform partners to access the cameras through their private protocols.

Algorithm partners

It is possible for algorithm partners to develop algorithms which can be applied in 5 Series cameras.

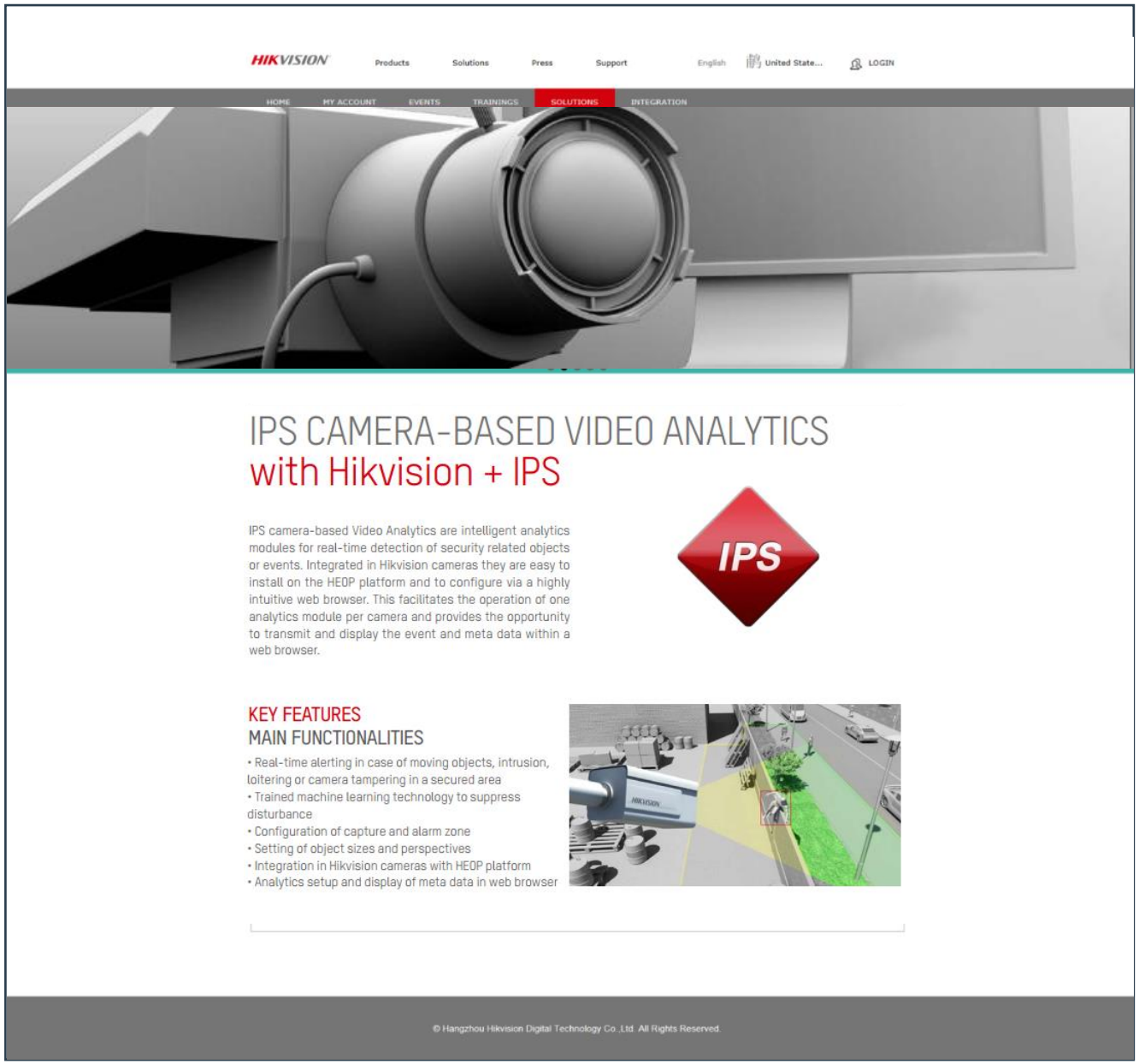
Successful Cases

IPS Intelligent Video Analytics

A German manufacturer of sophisticated video products. IPS has been developing its latest generation of IP-based software solutions for video analytics and management. IPS products are successfully installed in numerous applications. Selected solution partners, providers and distributors successfully sell the current IPS products across Europe.

Applications

- IPS Motion Detection
- IPS Sabotage Detection
- IPS Intrusion Detection
- IPS Loitering Detection
- IPS Indoor Detection



How to Use HEOP

https://partner.hikvision.com/tpp

01

Obtain devices from any Hikvision channel

02

Enter into Hikvision HEOP portal

03

Select Apps

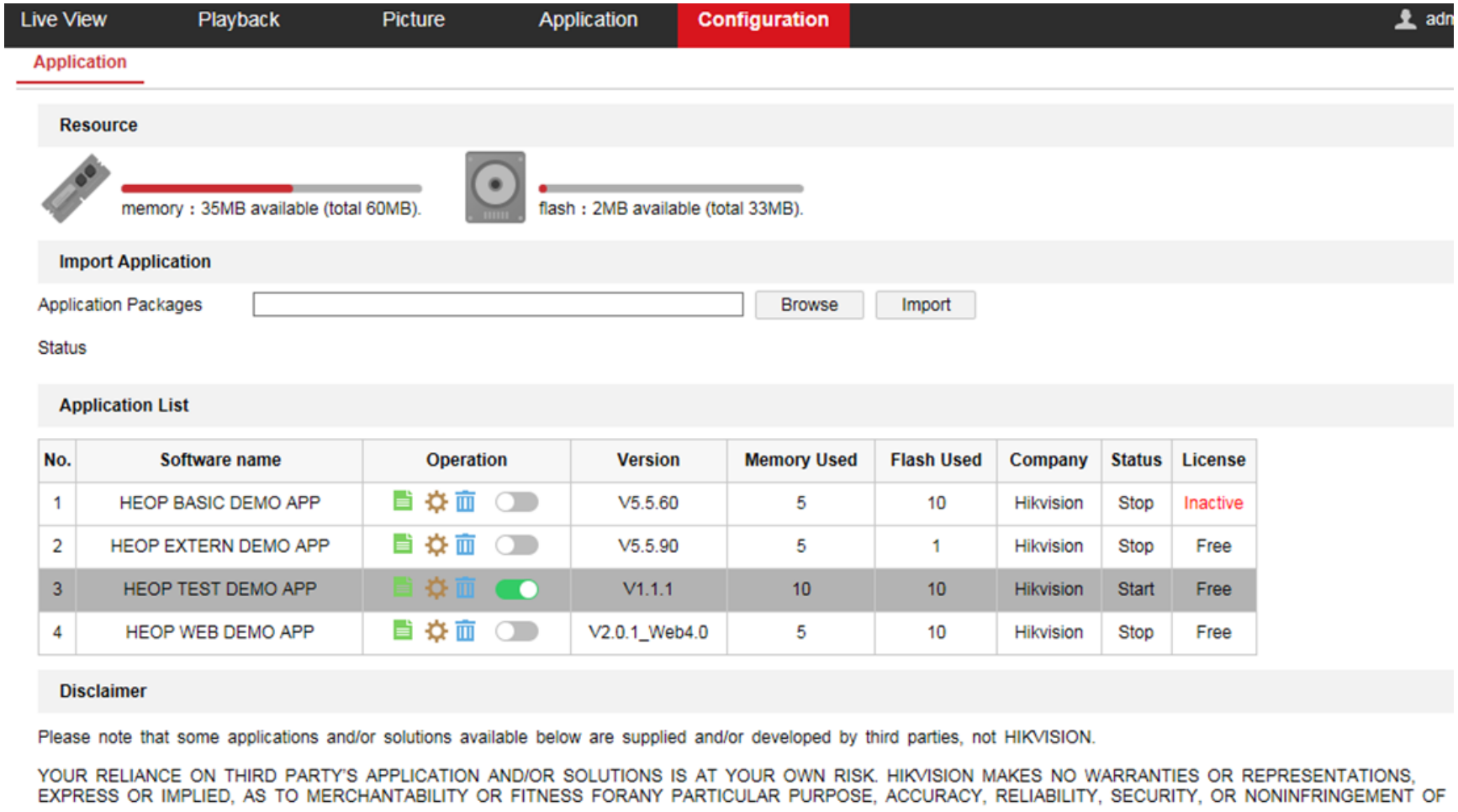
04

Buy license code from partners

05

Generate license on portal by using serial number and license code

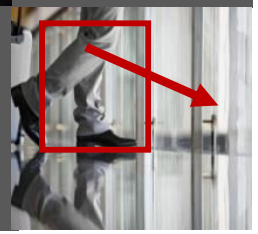
HEOP in 5 Series



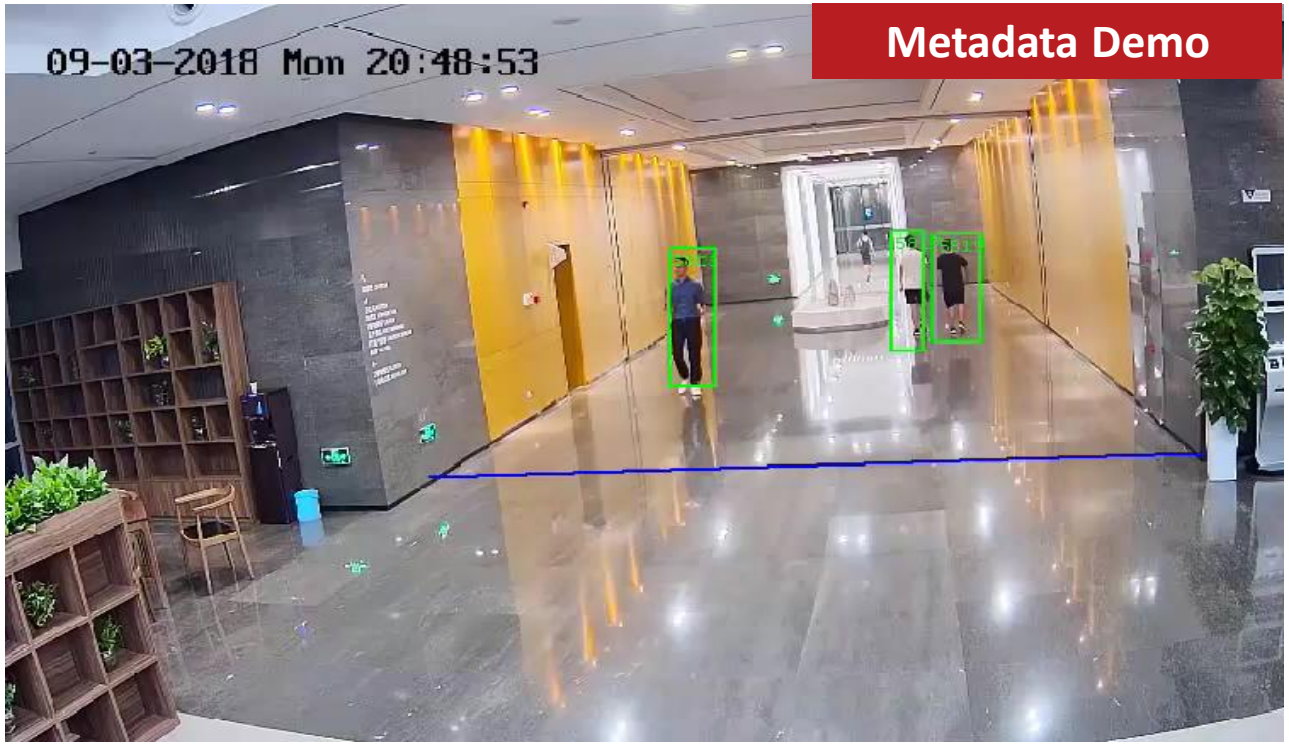
- Each 5 Series camera supports 4 Apps
- YUV is provided to support algorithm development
- RTSP is supplied for software application

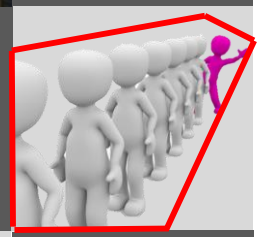
Firmware version: 5.5.90

Metadata for 7 Series

Intelligent Function	
	Intrusion
Line Crossing	
	Region Entrance
Region Exiting	

7 Series cameras can provide **metadata** based on ONVIF & ISAPI, which provides the ability for third-party platform to support the function of quick retrieving relevant images from abundant video data in the backend device, or tracing targets to make more analyze.



Intelligent Function	
	Face Detection
Flow Analysis	
	ANPR

Contents

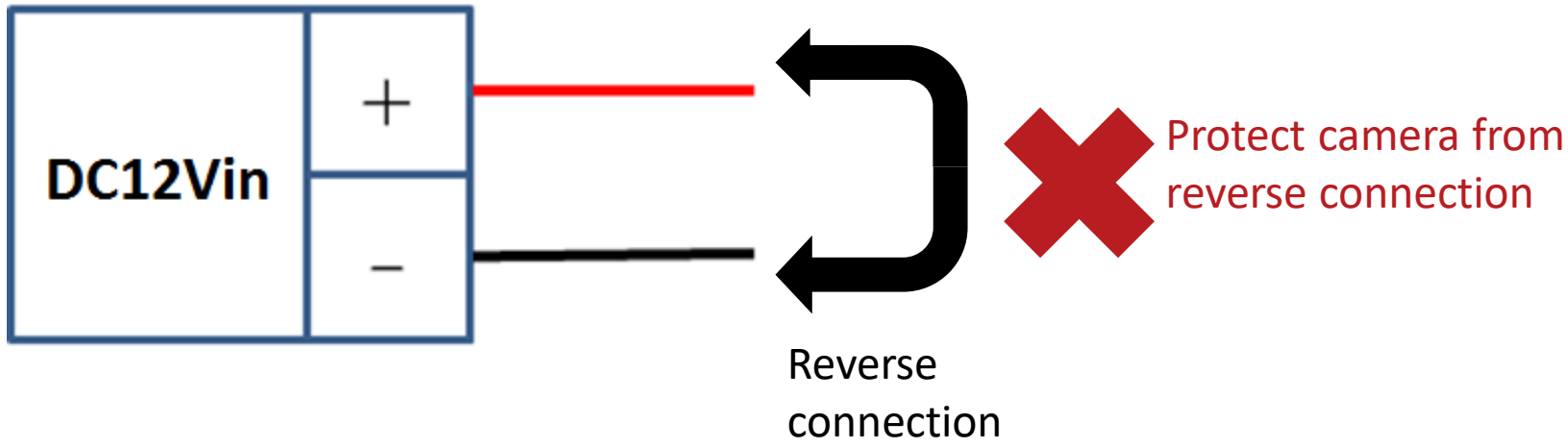
Dual-File System Backup

Backup File System helps camera working normally when main file system suffer from unexpected failure.

Main file system will copy from backup file system to recover from the failure.

Reverse Power Protection

Reverse Power Protection prevents damage to camera when power cords are accidently reversed.



DS-2CD50xxG0
DS-2CD51xxG0
DS-2CD55xxG0

Anti-corrosion

Suitable for normal atmospheric environment where cameras without protection may be corroded like **temperate coastal** or **acid rain environment**.

DS-2CD5Ax6G0-IZS(H)Y
DS-2CD55x6G0-IZS(H)Y

Anti-corrosion painting
NEMA 4X Standard

Temperate coastal environment

Acid rain environment

Inner Anti-fog Coating

- The **inner anti-fog coating** inside bubble or lens cover can prevent vapor condensing when vapor ingress into camera and saves maintenance cost.

✖ Improper installation procedure may lead to vapor coming into camera and desiccant losing efficiency.

✖ Improper storage may lead to vapor coming into camera and desiccant losing efficiency.

DS-2CD5AxxG0
DS-2CD55xxG0

Special Waterproof Design for Cable

The special waterproof design for cable can protect the camera from water ingress when improper installation occurs.

- ✖ Improper installation of network cable waterproof jacket may lead to leaking through cable.
- ✖ Improper installation of junction box may lead to leaking in junction box.

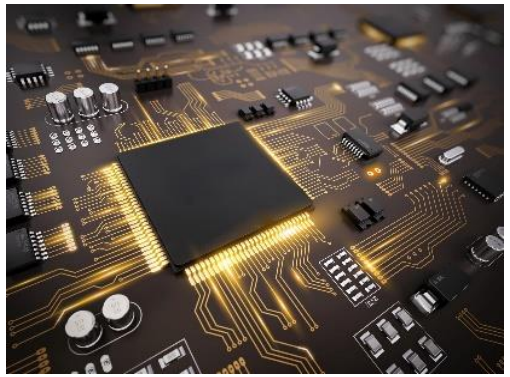
DS-2CD5AxxG0
DS-2CD55xxG0

Contents

AcuSense Features

Strobe light and audio alarm

AcuSense Technology



One Stand-alone Chip

+

Hikvision
Deep Learning Algorithm

- False Alarm Filter
- Strobe Light & Audio Alarm
- Powered By Darkfighter

DS-2CD2346G1-I/SL
DS-2CD2326G1-I/SL
DS-2CD2T46G1-4I/SL
DS-2CD2T26G1-4I/SL

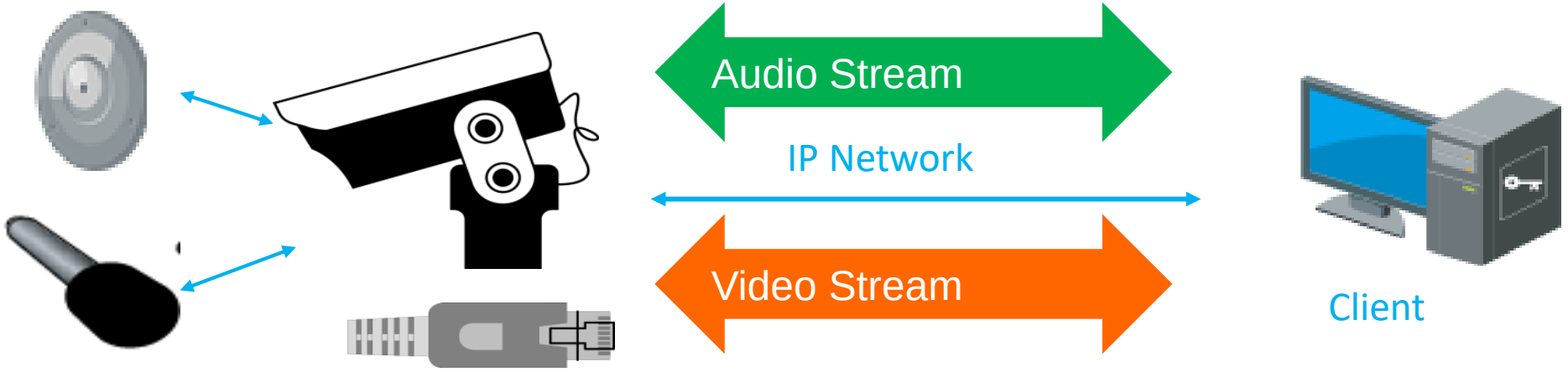
AcuSense Demo

Strobe light and audio alarm

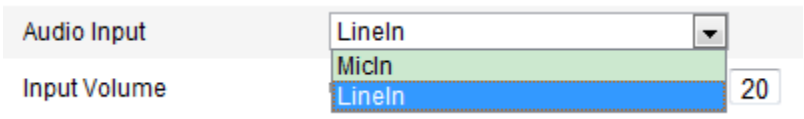
Contents

Audio Support and Equipment

- A network video system with integrated audio support. Audio and video streams are sent over the same network cable.



- With mic-in/line-in support, users have the option of using another type or quality of microphone than the one that is built into the camera or video encoder.



MicIn and LineIn are selectable for the connected microphone and pickup respectively.

Microphone vs Pickup

Comparison	Microphone	Pickup
Interface	Mic In	Audio In or Line In
Direction	Unidirectional	Omnidirectional
Quality	Not good	Good
Sensitivity	Low	High
Power	Passive	Active
Application	Shop, ATM, etc.	Law enforcement

NOTE

- ✓ Multiple factors affect the audio quality.
- ✓ The user must choose all of them carefully.

Contents

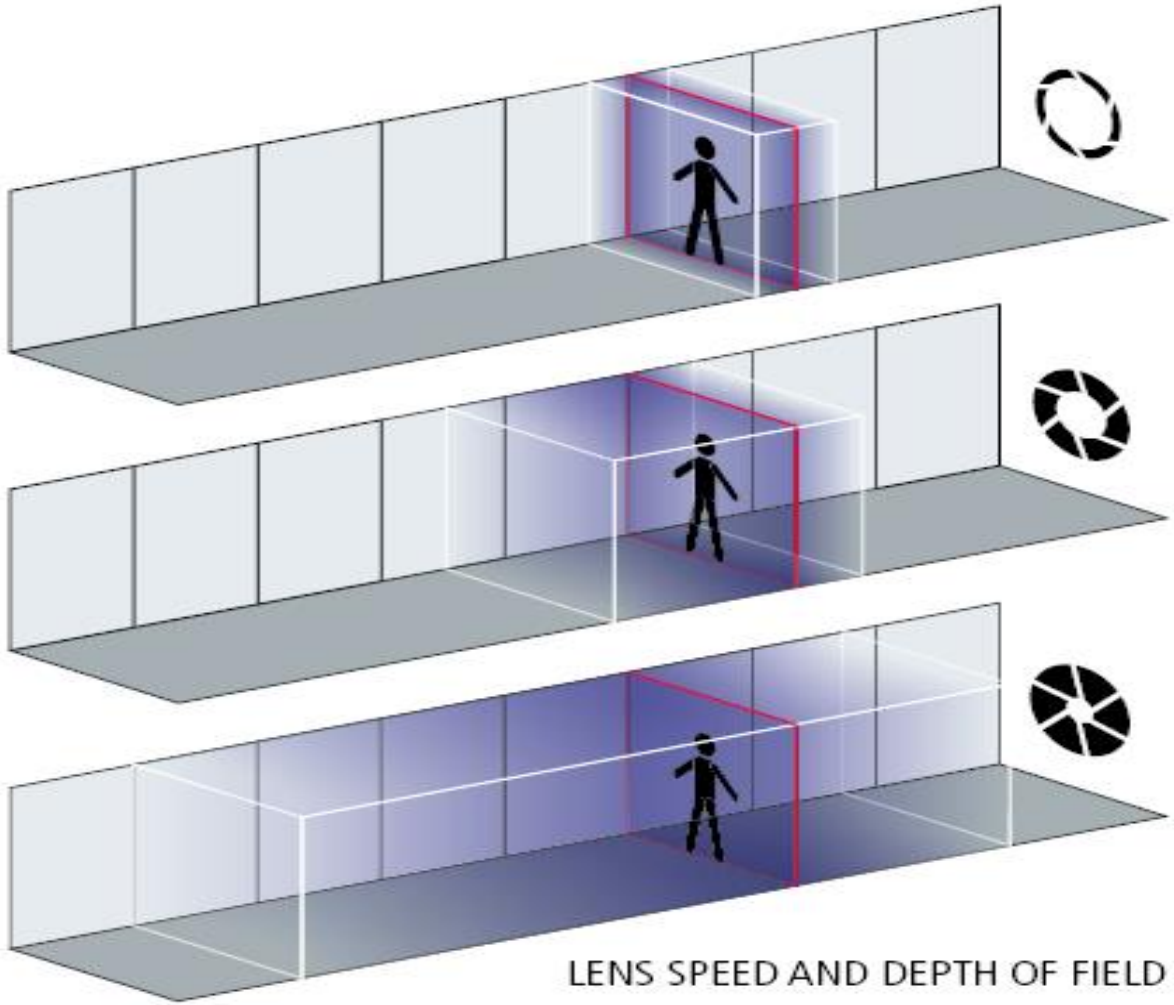
Image clear in the day but blurry at night

Depth of field is long during the day but short during the night, when you adjust the focusing point out of the DOF at night, image turns blurry.

Image clear in the day but blurry at night

Solution:

Adjust the focus during the night



LENS SPEED AND DEPTH OF FIELD IMAGE

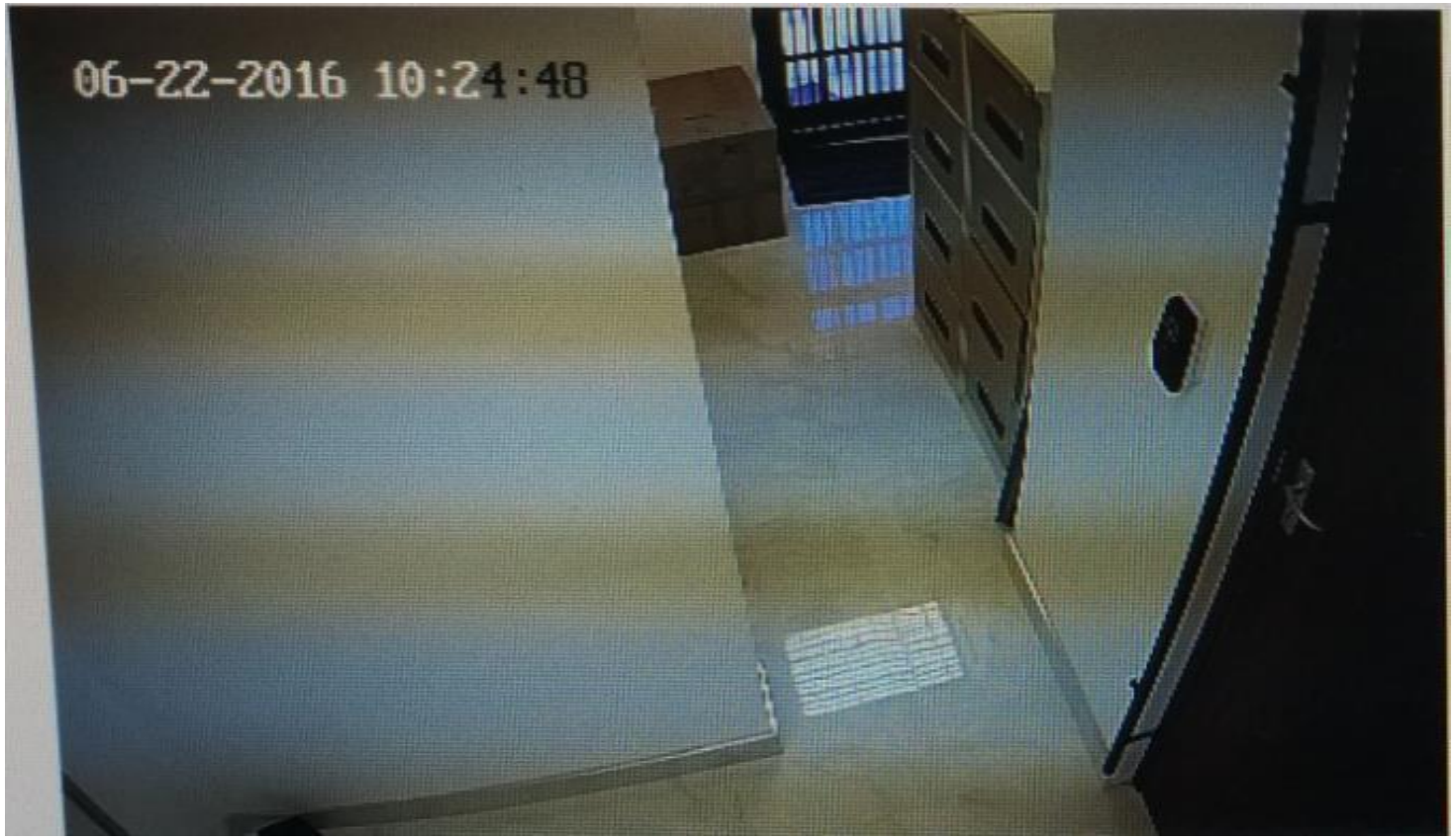
Blurry Image

When the video contains many moving objects, exposure time would be a key point to be considered.

Solution:
Adjust the exposure time from the default 1/25 to 1/100 or faster

Scrolling line issue

- **Issue**: In AC powered artificial lighting condition, the image will appear scrolling lines as shown below.



Scrolling line issue

- Principle:

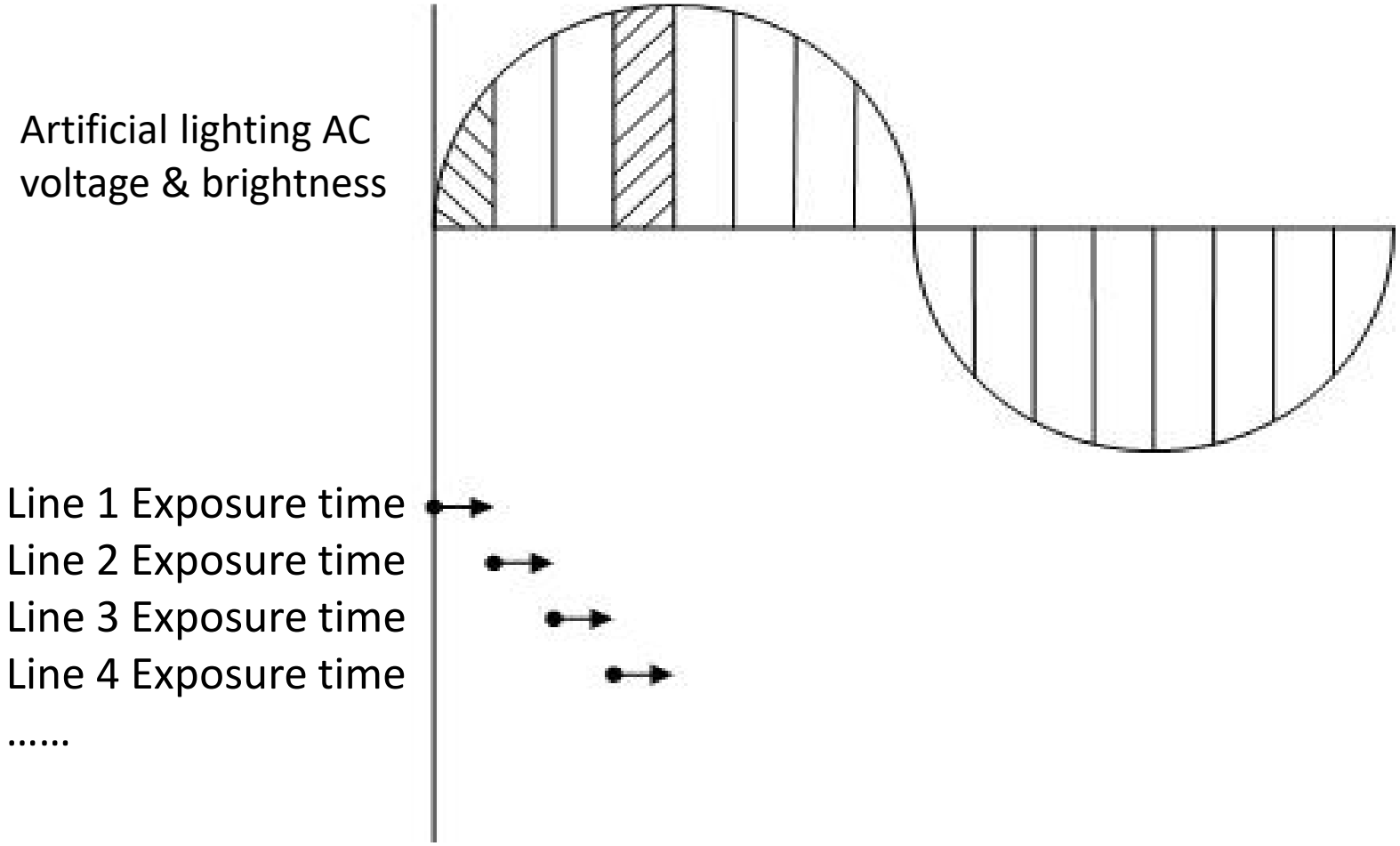
Light frequency

↕

MISMATCH

↕

Exposure time



Solution:

- **1.** Switch off WDR function, the image get a little bit better, but still has yellow lines on image.

- **3.** Change exposure time to 1/25, 1/50, 1/100, 1/250, until 1/2000. No more help, some even worse.

- **4.** Check the installation and the environment.

Comparison

Thanks!