



Video Surveillance Network Solution

Network Planning Guide

V1.0.2307A

Introduction

- **Overview**

This document provides methods, considerations, and recommendations for video surveillance network planning, as well as installation, debugging, and acceptance guidance. It is designed to help readers gain a comprehensive understanding of relevant information related to video surveillance deployment.

- **Intended Audience**

This is applicable to network planning engineers, hardware installation engineers, commissioning engineers, on-site maintenance engineers, and system maintenance engineers.

- **Matching Products**

This document provides information on how to conduct delivery and acceptance inspections based on products related to video surveillance solutions. The applicable product models are shown in the following table.

Product Categories	Product Model
Security Camera	Lite Series / Ultra Series / Pro Series
NVR	NVR101-8C / NVR101-8C-8P / NVR102-8C-8P / NVR102-9C / NVR102-16C / NVR102-16C-16P / NVR202-8C-8P / NVR202-16C / NVR202-16C-16P / NVR202-9C / NVR204-32C / NVR204-32C-16P / NVR304-32C / NVR308-64C / NVR716-128C / NVR716-64C / NVR724-256C
VMS	VMS-201C
Display & Control	LM-3022 / LM-3055 / NVD3512-12M / NVD3510-4K
Video Storage	VS-2024S / VS-6048D

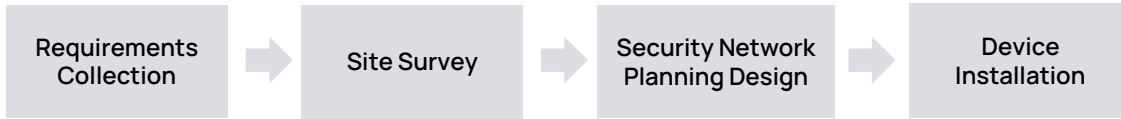
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01 Video Surveillance Network Planning Procedure

The basic flow of video surveillance network planning is shown in the following figure.



Steps		Instruction
01	Requirements Collection	Collect complete and comprehensive project information and requirements to reduce the need for redesign caused by insufficient information.
02	Site Survey	Conduct on-site surveys to gather more detailed information for the network design, such as monitoring areas, site lighting conditions, current network infrastructure, etc.
03	Network Design	According to the results of requirements collection and site survey, determine equipment and design system solutions.
04	Device Installation	Carry out the placement and installation of cameras, NVRs, and other network devices based on the network design, and ultimately hand over to the user for acceptance testing.

Requirements Collection

In order to design a video surveillance network solution that meets user needs, complete and effective information needs to be obtained during the requirements collection phase. The following is a list of common and important information regarding video surveillance network planning.

Table 1: Requirements collection checklist

Requirement Category	Key Point of Requirement Analysis
Objectives	<ul style="list-style-type: none"> • What are the primary objectives of the video surveillance solution, and which specific threats or risks are you looking to address or mitigate? • Are there any compliance, regulatory, or privacy considerations that need to be taken into account?
Scope and Environment	<ul style="list-style-type: none"> • What is the size and layout of the areas or locations that require monitoring? Provide the customer with architectural floor plans or photographs. • Estimate the number of cameras. If you are unsure about the quantity, you can provide a floor plan to FS technicians for confirmation.
Monitoring Requirements	<ul style="list-style-type: none"> • What types of incidents or events should the system monitor (e.g., unauthorized access, intrusion, fire, theft, motion detection)? • Should any specific actions or alarms be triggered when an event is detected? • Do you require real-time monitoring or playback/review capability? • Are there considerations regarding image size or quality, and do you need any specific video analytics or advanced features (e.g., facial recognition, automatic license plate recognition)?
Security Cameras	<ul style="list-style-type: none"> • What are the installation locations (e.g., entrances, perimeter, hallways, office building)? • What is the preferred camera type (e.g., fixed, PTZ, dome)? • Are there any specific camera specifications or features needed (e.g., resolution, night vision, weatherproof, explosion-proof)? • Are there any special installation requirements (e.g., wall-mounted, pendant-mounted, ceiling-mounted)? • Are there any power supply limitations (e.g., PoE, electrical power)?
Storage and Data Management	<ul style="list-style-type: none"> • How long do you need to retain recorded videos or data? • Are there specific storage capacity requirements? • Are there any specific data backup or redundancy requirements? • Do you need centralized management and access control for recorded data?
Integration and Connectivity	<ul style="list-style-type: none"> • Do you need the surveillance solution to integrate with any existing security systems (e.g., access control, alarm systems)? • Do you require remote access and monitoring? If yes, what is the preferred method (e.g., mobile application - smartphone app, web-based interface)? • Are there any specific network or connectivity requirements or restrictions?
Video Management Platform	Do you have specific requirements for the video management platform? For a small number of devices, Guard Station is recommended; for a larger number of devices, IPSAN or the newly launched MVS-503C is recommended.
Special Requirements	Are there any other special requirements?

03

Site Survey

Conducting on-site surveys is an essential step in designing a comprehensive video surveillance solution. It involves accessing the locations where the surveillance system needs to be installed, assessing the environment, identifying potential challenges, and determining the optimal camera placements.

The tools used in site survey and site survey information collection items can be referred to below.

3.1 Tool Preparation

In order to complete the site survey tasks, it is necessary to use a variety of tools for assistance. The following are common tools.

Table 2: Site survey tools

Tool Type	Tool Name	Tool Instructions
Hardware Tools	Tape Measure	Measure distances, dimensions, and heights within the site.
	Laser Rangefinder	For larger areas or outdoor spaces, a tape measure might not suffice. A laser rangefinder is a convenient tool for rapidly and accurately measuring distances.
	Mobile Device	Smartphones or tablets can be used for documenting, capturing photos during the site survey, and referencing relevant documents or charts. They also facilitate access to camera specifications or other resources at any time and place.
Other Tools	Architectural Floor Plan	Pre-print architectural floor plans for easy reference during the site survey, aiding in verifying if the drawings match the actual site environment and for recording information.
	Security Equipment	Depending on site requirements, safety equipment such as hard hats, safety vests, or appropriate footwear may be necessary.

3.2 Site Survey Information to Be Collected

In order to ensure that site survey personnel can collect information more comprehensively and accurately, the following table lists the site survey information that needs to be collected for their reference. When conducting site surveys, site surveyors should collect information based on the table, and record the collected information in detail at the corresponding positions on the architectural drawings.

3.2.1 Monitoring Areas

- Description

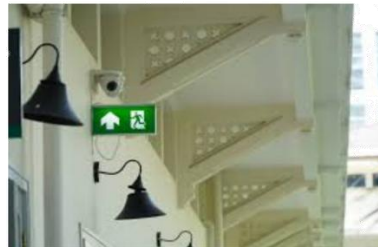
Obtain the layout or floor plan of the location and conduct a site walkthrough to identify areas requiring monitoring, including entry/exit points, high-risk zones, sensitive locations, and critical assets, while noting blind spots and potential unauthorized access areas.

- Examples

Typical areas that require monitoring include: entrances and exits, emergency exits, parking lots, cashiers' areas, reception areas, loading and unloading zones, delivery entrances, hallways, perimeter areas, fences, windows, and more.



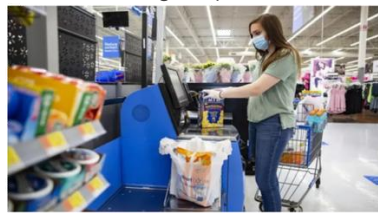
Entrance and Exit



Emergency Exit



Parking Lot



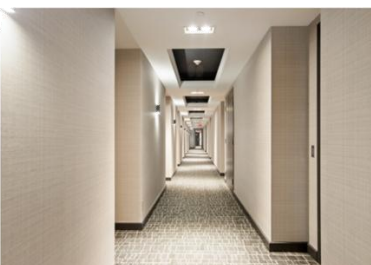
Cashier Area



Reception Area



Delivery Entrance



Corridor



Fence

3.2.2 Lighting Conditions

- Description

Evaluate the lighting conditions across the entire site. Depending on the situation, daytime and nighttime assessments may be required.

- Examples

Light intensity: Check the light intensity in the monitoring areas. In low-light environments or at night, consider using additional lighting equipment to provide sufficient illumination.

Light direction: Camera installation positions should not directly face or be directly against the light source; they should be slightly offset from the light source. During the site survey, pay attention to whether the camera installation meets this requirement.

3.2.3 Current Network Infrastructure

- Description

Consider the existing infrastructure, such as power supply, wireless connectivity, and current network bandwidth.

- Examples

Infrastructure: Determine the appropriate power supply conditions based on the existing facilities and requirements under the plan, and choose the best power supply method accordingly.

Network Infrastructure: Verify the existing network infrastructure's type and assess whether optimizations or modifications are needed based on requirements. For medium to large-scale surveillance projects, most surveillance devices are deployed within the intranet. If remote access to the surveillance system via a mobile app is required, consider setting up a VPN.

Network equipment: Such as switches, storage devices, etc. Evaluate whether the existing network equipment meets the requirements of the new plan and whether it can be reused. When dedicated video transmission is required, consider the current bandwidth compared to the actual video transmission bandwidth.

3.2.4 Environmental Considerations

- Description

Consider the requirements for professional equipment or installation techniques in specific environments, such as extreme temperatures, humidity, dust, or exposure to weather conditions. Choose cameras that are suitable for specific environmental conditions accordingly.

- Examples

For outdoor, harsh, or vulnerable environments, consider selecting cameras that offer waterproof and dustproof (IP67) as well as vandal-resistant (IK10) features.

In industrial settings where dust, liquids, chemicals, etc., can potentially damage cameras, IP67 and IK10-rated cameras are suitable for harsh environments.

In public places like parking lots, cameras may be susceptible to vandalism and impacts. IK10-rated cameras provide good impact resistance.

3.2.5 Field of View and Range

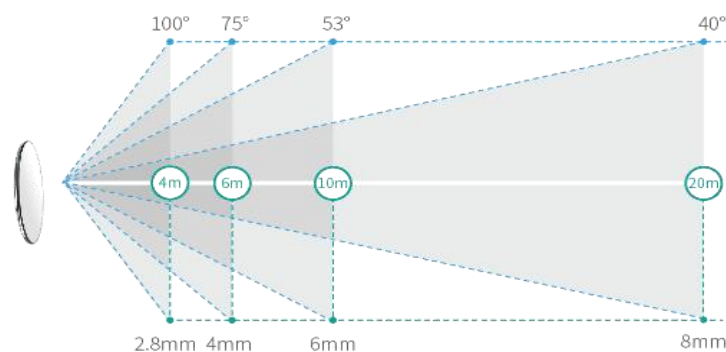
- Description

Different types of cameras should be selected for different room sizes, taking into account the camera's installation method and the focal length

- Examples

During camera installation, junction boxes and related brackets will be used. For environments with higher ceilings, brackets are necessary to provide better monitoring results. In environments with normal ceiling heights, dome or turret cameras can be selected for ceiling mounting.

FS cameras offer focal lengths ranging from 1.4mm to 13.5mm, including common fixed focal lengths such as 2.8mm/4mm and variable focal lengths from 2.8mm to 12mm. These options can meet the shooting needs in various indoor and outdoor environments. In general, the larger the focal length, the smaller the field of view and the longer the monitoring distance.



In practical application scenarios, a 2.8mm focal length is suitable for narrow spaces such as elevators and staircases, while a 4mm lens is suitable for slightly larger areas like meeting rooms and small shops. For larger and more open areas like parking lots, factory floors, and courtyards, you can opt for lenses with focal lengths of 6mm or more. The specific choice should be based on the requirements of your actual scenario.



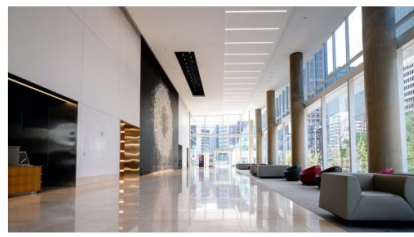
Elevator or Staircase 2.8mm



Meeting Room 2.8/4mm



Small Grocery Store 4/6mm



Lobby or Hall 4/6mm



Parking Lot 4/6mm



Fence 8/12mm

3.3 Site Survey Skills

To ensure that a network switch can provide enough PoE power, it's essential to calculate the total power requirements of all devices connected to that switch. This total power requirement must remain within the switch's PoE power budget.

Table 3 illustrates the minimum and maximum power levels required for both Power Sourcing Equipment (PSE) and Powered Devices (PDs).

Type	Standard	PD Min. Power Per Port	PSE Max. Power Per Port	Cable Category	Power Over Pairs
Type 1	IEEE 802.3af	12.95W	15.4W	Cat5e	2 pairs
Type 2	IEEE 802.3at	25W	30W	Cat5e	2 pairs
Type 3	IEEE 802.3bt	51W	60W	Cat5e	2 pairs class0-4, 4 pairs class5-6

04 Video Surveillance Network Design

Based on the collected requirements and site survey results, start detailed video surveillance network planning which mainly includes device selection and network system design.

4.1 Device Selection

4.1.1 Security Camera

Choose security cameras that align with specific business or operational scenarios.

Table 4 provides an overview of camera categories and their performance parameters.

Categories	Description	
Camera Type	Bullet	Fixed monitoring positions, suitable for entrances, walkways, and corridors. IP67 and IK10 ratings make them suitable for outdoor use.
	Dome and Turret	Typically used in office areas, hallways, elevators, and similar fixed locations. They can be ceiling-mounted.
	PTZ (Pan-Tilt-Zoom)	Provide versatile surveillance with the ability to pan, tilt, and zoom. Suitable for outdoor open areas, parks, and large retail spaces.
	Fisheye	Offer the widest surveillance field of view, creating a VR-like visual effect. Suitable for supermarkets, hotels, schools, and more.
Resolution	2MP / 4MP / 5MP / 8MP / 12MP	Higher resolution values result in better image quality. However, this also leads to larger bitrates, which require more network bandwidth and storage capacity.
Aperture	Use a large aperture in low-light scenes and a small aperture in well-lit scenes.	
Focal Length	Fixed	Fixed lenses are recommended for narrow scenes.
	Zoom	Zoom lenses are suitable for spacious environments.
In general, the greater the focal length, the narrower the field of view, but the longer the monitoring distance.		

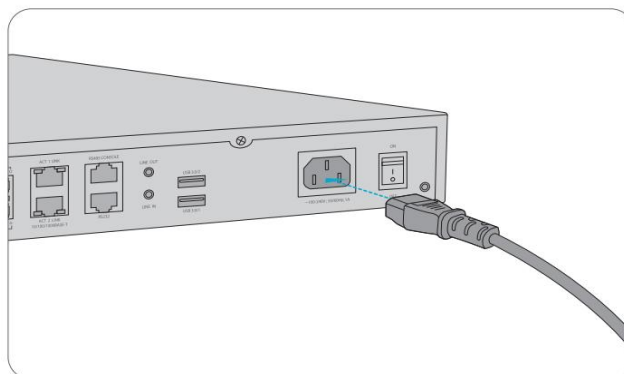
Categories	Description	
Horizontal Field of View	Wide-Angle / 160° / 360°	The horizontal field of view determines the width the camera can cover. A wider field of view allows the camera to cover a larger area. The choice of field of view depends on how wide the area you want to monitor is.
Illumination Options	Infrared Night Vision Camera	Infrared night vision refers to displaying black and white images in low light conditions, such as below 0.01Lux, and displaying color images above 0.01Lux. It is generally used in environments with relatively good night vision lighting.
	Starlight Camera	Starlight-grade cameras display black and white images at 0.005Lux and color images above 0.005Lux. They are typically used in environments with dim night vision lighting.
	Full-Color Camera	Full-color cameras activate warm lights in low light conditions to provide color images, ensuring 24-hour full-color coverage. In conditions with no light at night, the night vision distance is often a consideration.
Connection Type	Wired	For regular applications, wired access can be used, providing power and transmitting signals through Ethernet cables.
	Wireless	Wireless access can be used in areas where flexible deployment is required, transmitting signals wirelessly.

4.1.2 Power Supply Type

- There are three power supply types for security surveillance systems: AC power supply, DC power supply, and Power over Ethernet (PoE) supply.

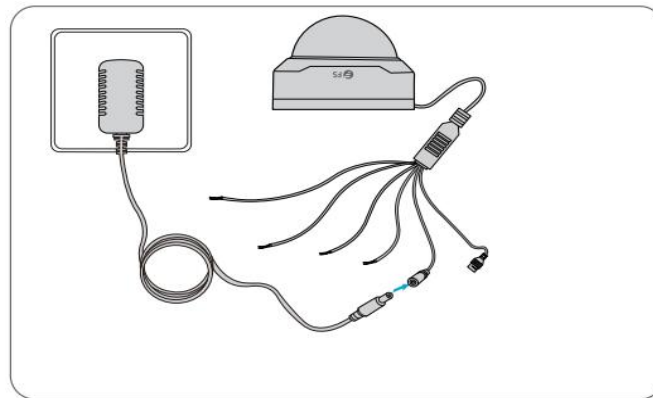
1. AC Power Supply

- Generally used for VMS devices, NVD devices, display devices, and IPSAN devices, it is a traditional power supply method.



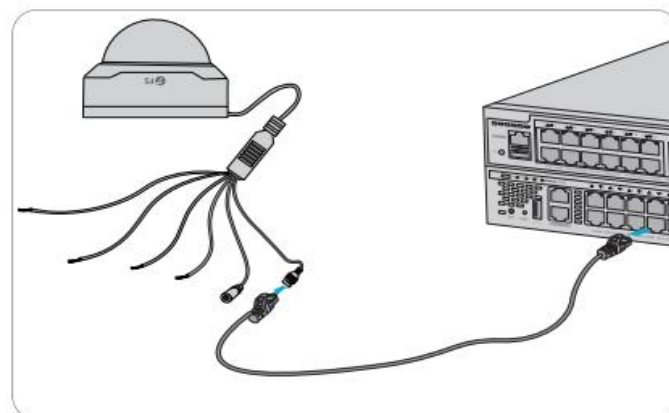
2. DC Power Supply

- It's commonly used in surveillance systems where cameras have specific voltage requirements.
- This method is suitable for cameras that don't support PoE (Power over Ethernet) and require a dedicated power source.
- When using DC power, it's important to ensure that the voltage and current specifications match the camera's requirements for safe and reliable operation.



3. PoE

- PoE power supply can provide power and data communication to cameras through an Ethernet cable connected to a PoE switch or NVR (that supports PoE), eliminating the need for a separate power line and simplifying the wiring process.
- The power consumption of PTZ cameras is typically higher. When using PoE for multiple PTZ cameras, it's essential to consider whether the switch's output power is sufficient.



4.1.3 Video Performance

- In the realm of security surveillance solutions, video performance encompasses various technical parameters and functionalities related to video, making it crucial for the effectiveness and reliability of a monitoring system. Here are some common considerations for video performance.
 1. **Video Resolution:** Video resolution determines the clarity and level of detail in monitoring images. Higher resolutions provide sharper images, aiding in the identification of details like people and vehicles. Common resolutions include 720p, 1080p (Full HD), 2K, and 4K. When selecting surveillance cameras, the appropriate resolution should be determined based on real needs and the scene.
 - For scenarios requiring the recognition of fine details such as faces and license plates, high-resolution cameras like 2K and 4K are recommended.
 - For scenes where observing general conditions and dynamic changes is sufficient, medium-resolution cameras like 720P and 1080P are suitable.
 - For simple monitoring and basic alerting scenarios, lower-resolution cameras like 480P can be used.



2. **Frame Rate:** Frame rate indicates the number of images displayed per second. Higher frame rates provide smoother video playback, avoiding stuttering and delays. Typically, surveillance systems operate at frame rates of 25 or 30 frames per second (fps).
 - The majority of cameras provided by FS support 30 fps to ensure the fluidity of images.

3. Image Processing Technologies: This includes features like backlight compensation, wide dynamic range (WDR), noise reduction, and more.
 - These technologies enhance image quality, reduce the impact of varying lighting conditions and environmental noise, and ultimately improve surveillance effectiveness.
 - Providing appropriate image processing technologies can meet users' requirements for video image performance.



Without WDR



With WDR

4. Low-Light Performance: Security surveillance systems often need to operate in low-light conditions, so excellent low-light performance is crucial. Cameras with good low-light performance can capture clear images in dimly lit environments, ensuring reliable monitoring.



Other Night Vision



FS Full Color Night Vision

5. **Video Analytics Features:** Modern security surveillance systems typically include various video analytics features such as motion detection, facial recognition, license plate recognition, and more. These features enable intelligent analysis and identification of monitoring videos, enhancing the efficiency and accuracy of the surveillance system.



4.1.4 Video Storage Features

- To ensure the effective and secure storage and management of video data to meet the needs of the surveillance system.

Table 5 introduces several important requirements for video storage features.

Features	Description
Storage Capacity	<p>Video surveillance systems generate a significant amount of video data, so there is a high demand for storage capacity. It's necessary to calculate the required storage capacity based on factors such as expected recording time and resolution, and then choose appropriate storage devices such as hard drives or network storage equipment.</p> <p>A common formula for calculating storage size is as follows: $\text{File size (GB)} = \text{Bitrate (Kbps)} \times 3600 \text{ (s/1h)} \times \text{hours of recording per day} \div 8 \div 1024 \div 0.9$. For example, with H.264 video encoding, recording at a bitrate of 4 Mbps for one day with 90% redundancy would require approximately 47 GB of storage.</p> <p>H.265 is the next-generation encoding standard that can compress video sizes to half that of H.264 without compromising image quality. With the same bandwidth, H.265 can transmit higher-quality video. Ultra H.265 can further compress video sizes to one-half or one-third of the H.265 standard.</p>

Features	Description
Storage Selection	For NVRs, you can use third-party surveillance hard drives from manufacturers like Western Digital and Seagate. To accommodate future system expansion and facilitate management, it's recommended to choose an NVR that supports the largest single hard drive capacity.
	IPSAN requires FS custom hard drives, with 14 TB for a single hard drive in a 48-bay unit and 8 TB for a single hard drive in a 24-bay unit.
Network Bandwidth	High-speed data transmission is necessary to support real-time monitoring and recording. A fast data transfer rate ensures smooth and accurate images.
	In terms of remote storage or backup, the bandwidth and speed of network transmission should be taken into account. In general, the storage system should be connected to a 10 Gigabit Ethernet switch.
Reliability and Stability	The design of the solution should consider the system's ability to run smoothly and maintain data integrity. Focus on the stability of video transmission, system fault tolerance, and the system's ability to recover from network or equipment failures.
Security	Video data should be protected during storage and transmission to prevent unauthorized access and tampering. Therefore, storage devices and transmission channels should employ security mechanisms such as encryption and access control.
Scalability and Compatibility	The solution design needs to consider the system's scalability to support future increases in cameras and user requirements.

4.1.5 Image Presentation

- What details are to be observed with the camera? Is detection of objects/people, recognition of individuals, or identification of unique facial features required?
 1. Detection: Utilized for the identification of potential anomalies or threats, including motion detection, occlusion detection, audio variance detection, etc.
 2. Recognition: Employ images for the identification of a person whom the observer already knows, even if the person's face is not fully visible or clear. Other visual factors (height, body shape, gait, clothing, etc.) also influence recognition.
 3. Identification of Unique Facial Features: If facial recognition through images is necessary, image quality must be a crucial consideration. The image should possess the quality suitable for capturing facial images. The goal is to minimize the risk of errors, ideally with none.

4.1.6 Display & Control Device Selection

- **Table 6** provides some guidance for choosing display & control device.

Number of Connected Cameras	Whether Decoders Are Required	Decoder Channels	Monitoring Screen
<36 Channels	X	/	It is recommended to use a built-in monitor.
37 ~ 144 Channels	√	10 Channels	3x3 Display Screen
>144 Channels	√	12 Channels	3x4 Display Screen

- When choosing screens, you can follow the following principles:
 1. For large monitoring areas, it is recommended to select a 55-inch screen.
 2. For smaller areas, a 46-inch screen can be chosen.
 3. If the budget allows, opt for a 55-inch large screen.
 4. If the budget is tight, a 46-inch screen is a cost-effective choice.

4.1.7 Management Platform Selection

- **Table 7** provides some guidance for choosing management platform.

Number of Connected Cameras	Suggestion
<64 Channels	A 64-channel NVR can be selected, managed through the medium-sized management platform GuardStation, with the NVR serving as the storage device.
64 ~250 Channels	IPSAN can be chosen; utilized as an all-in-one video storage device.
250 ~ 1000 Channels	VMS-503C and IPSAN can be selected; with VMS-503C acting as the management platform and IPSAN serving as the storage device.

4.2 Network Design

Based on the collected requirements and site survey results, it's time to start the detailed network planning and design. Network planning primarily involves designing the network topology, bandwidth considerations, security measures, storage solutions, device management, and monitoring. FS boasts a professional solution design team with over 1000 specialized engineers, ensuring the delivery of reliable solutions. Below is a general approach to network system design:

4.2.1 Network Topology

- In actual projects, the network topology should be based on the user's network scenario.

Table 8 provides an illustration of typical network topologies.

Scenarios	Common Topologies	Characteristics	Key Considerations
Small-scale scenarios such as stores and homes;	NVR + Switch	Direct access to the Internet	Consideration should be given to whether there are enough ports for switches and NVRs.
Medium to large-scale scenarios including chain stores, businesses, and campuses	Integrated within an existing local area network, with an emphasis on scenario network topologies	Typically involve local area network planning, with the system directly connecting to the local area network	For LAN network architecture within the local area network, prioritize planning VPN for users' remote needs in advance to facilitate remote access for users.

4.2.2 Network Bandwidth

- In small-scale scenarios, a bandwidth of 100 Mbps is generally sufficient to meet system requirements. Therefore, this section will primarily focus on the bandwidth considerations for medium to large-scale scenarios.
- In practical medium to large-scale scenarios with a higher number of devices and significant video traffic, insufficient network bandwidth can lead to issues such as network congestion, which can disrupt the normal operation of the surveillance system. In this context, two key points need to be considered regarding network bandwidth:
 1. First Issue: Total Bandwidth for Aggregating Devices to the VMS Management Platform
 - To address this concern, you can calculate the bandwidth occupied by camera video streams in the current scenario by considering the number of cameras and their respective bitrates.

- Then, compare this calculated bandwidth with the actual available bandwidth in the scenario.
 - For scenarios where multiple chain stores need to transmit data to a central headquarters, it's essential to factor in the cost of dedicated lines for efficient data aggregation.
2. Second Issue: Bandwidth for the IP SAN Storage Device Connected to the Switch
 - Conventional IP SAN and similar storage products require a connection to a 10 Gigabit Ethernet switch for optimal performance.
 - NVR and other storage products can effectively operate with a 1 Gigabit Ethernet switch.

4.2.3 Network Security

- For security in surveillance systems, the primary network protection functionalities are typically provided by gateway and firewall products with their encryption methods and certain capabilities to defend against network attacks. In addition to these, the security features of surveillance products focus on safeguarding data through various measures.
1. Password Security: Emphasis is placed on secure device access and logins. This includes enforcing strong password policies and utilizing secure network communication protocols such as HTTPS.
 2. Data Readability: Surveillance systems often employ proprietary recording formats. Data stored on hard drives may not be accessible when placed in different manufacturers' NVRs or computers.
 3. Encryption and Algorithms: Encryption techniques like AES and specific encoding formats like Unicode are employed to enhance security. These methods typically require compatibility with FS's backend equipment for decoding.

4.2.4 Network Storage

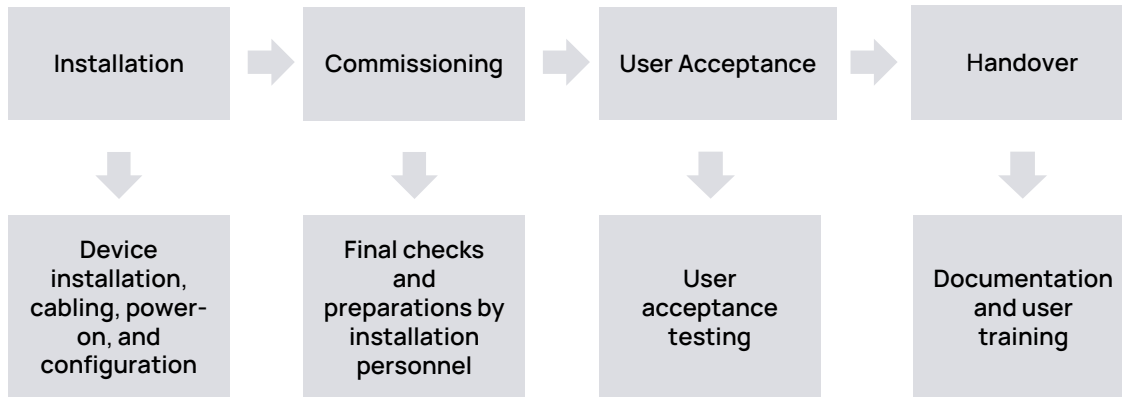
- When planning a network setup, it's essential to calculate the storage capacity required for the specific scenario and select appropriate storage products accordingly.
- In the design of video surveillance systems, the requirements and capacity selection for storage devices can be referenced from the information provided in section 4.1.4.

4.2.5 Management Platform

- In the context of security surveillance scenarios, the web interface is primarily used for configuring related tasks, while the actual operational tasks are performed on the client side. Therefore, whether you choose to use an NVR or VMS as the management platform, it should align with the practical requirements of security surveillance.
- The selection of a management platform can be guided by the information provided in section 4.1.7.

05 Installation & Implementation

The basic flow of installation and implementation in terms of video surveillance network planning is shown in the following figure.



5.1 Installation

5.1.1 Installation Considerations

- Please take note of the following considerations before installation to ensure the effective operation and optimal performance of the system.

1. Safety Precautions

- When working at heights, always use the necessary scaffolding.
- Installers should take safety precautions and wear safety harnesses during operations.
- If the highest temperature in the installation area exceeds 50° C or the lowest temperature is below -20° C, the product should be installed in a restricted area accessible only by professionals.
- Keep the equipment away from heat sources, open flames (such as electric heaters, candles, etc.), and strong magnetic fields (such as high-voltage transformers).
- The power adapter used for the equipment must meet the power input voltage and current requirements specified on the equipment label.
- For outdoor installations, install lightning arresters, and ensure the equipment enclosure is effectively grounded.
- All installation and maintenance work related to this device should be performed by professional maintenance technicians or system installers.

2. Operational Guidelines

- Confirm the device's installation location and mark it with a marker.
- During installation, monitor and adjust the camera's image in real-time to avoid poor monitoring performance after installation is complete.
- Ensure that direct sunlight or strong light sources, such as streetlights, do not shine directly onto the camera lens after installation.
- It's recommended not to install infrared cameras in dark corners indoors to avoid black and white images during the day when the light-sensitive components perceive low light conditions.
- If the camera image shows a grid pattern, and there are low-color temperature light sources (such as sodium lamps) nearby, adjust the camera to ensure that there are no low-color temperature light sources within a 10-degree extension outside the camera's field of view (inside the field of view is not affected).
- Avoid installing cameras near objects with strong reflective properties such as glass, floor tiles, water surfaces, or leaves. Otherwise, it may result in overly bright or dark areas in the image.
- Cameras may have a transparent protective film on their dome or window surface. Do not remove the outer transparent protective film during installation to avoid scratching or contaminating the camera's dome or window. Remove this transparent protective film only after confirming the installation is complete and before starting the device.
- Inspect the wall or pole where the equipment is to be installed. It should be able to withstand at least four times the total weight of the bracket, housing, and camera.
- Confirm the cable routing path and measure the required cable length using a steel tape measure.

3. Privacy and Compliance

- The use of this device may involve the collection of personal information such as facial features, fingerprints, license plate numbers, email addresses, phone numbers, and global positioning system data. Please comply with local laws and regulations when using the device.
- When using this device, you should adhere to relevant laws and regulations and respect the legitimate rights of others. If you install cameras in public places, provide conspicuous notices stating: "You are entering an electronic surveillance area."

5.1.2 Installation Guidelines

- Below, we provide installation guidelines for the main devices, including cameras and NVR. Installation of other display devices, cables, and related components should be performed by professional installation engineers based on the specific circumstances.

Device Type	Quick Start Guide	Applicable Models
Security Camera	Lite Series Turret Cameras Quick Start Guide	IPC101-2M-T / IPC101-5M-T / IPC104-2M-T / IPC104-5M-T
	Bullet Network Cameras Quick Start Guide	IPC101-2M-B / IPC101-5M-B / IPC104-2M-B / IPC104-5M-B
	Lite Series Dome Cameras Quick Start Guide	IPC101-2M-D / IPC101-5M-D / IPC104-2M-D / IPC104-5M-D
	Pro Series Dome Cameras Quick Start Guide	IPC305-2M-D / IPC301-8M-D
	Fisheye Dome Network Cameras Quick Start Guide	IPC301-5M-F
	Full Color Bullet Cameras Quick Start Guide	IPC501-FC-4M-B / IPC501-FC-8M-B
	Full Color Turret Cameras Quick Start Guide	IPC501-FC-4M-T / IPC501-FC-8M-T
	PTZ Network Cameras Quick Start Guide	IPC425-4M-P / IPC204-5M-P
NVR	Network Video Recorders Quick Start Guide for NVR202&204&304 Series	NVR202-8C-8P / NVR202-16C-16P / NVR202-9C / NVR202-16C / NVR204-32C-16P / NVR304-32C
	Network Video Recorders Quick Start Guide for NVR101&102 Series	NVR101-8C / NVR101-8C-8P / NVR102-9C / NVR102-16C / NVR102-8C-8P / NVR102-16C-16P

5.2 Debugging

Debugging in the security surveillance solution is a crucial step to ensure the system's proper functioning, provide high-quality monitoring images, validate alert functions, and address potential issues and failures. Debugging helps enhance the reliability, performance, and security of the security surveillance system, offering users a better monitoring and protection experience.

The following section outlines how to perform basic debugging, while additional debugging tasks can be carried out by installation engineers based on specific circumstances.

5.2.1 Adjusting the Field of View

- After the camera installation is complete, it's essential to make minor adjustments to the field of view to ensure complete coverage of the intended monitoring area.
- In scenarios such as facial recognition or surveillance, you may increase the zoom slightly to remove unnecessary peripheral areas from the frame while maintaining the required pixel size for faces.
- The camera's pitch and yaw angles should be adjusted as needed to avoid angles that are too small or too large based on the actual situation.

5.2.2 Adjusting Image Clarity

- Once the field of view and zoom level are confirmed, it's essential to adjust and verify the focus clarity.
- For cameras that support automatic focusing, the highest image clarity quality is achieved when automatic focusing is completed. If the monitoring image quality doesn't meet the requirements, you can manually adjust the focus to improve image clarity using the following steps.

1. Web interface



2. Client interface



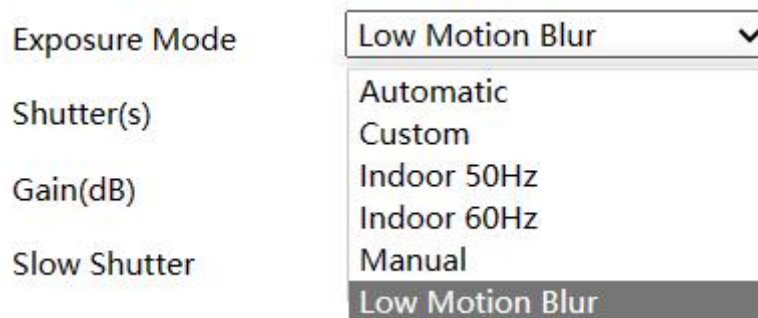
- Once the adjustments are made, you can confirm the clarity of the adjustments in the following ways.
 1. A quick and effective method is to have a model stand in the frame, making sure the model's head appears in the lower 1/3 of the frame, the middle section of the frame, and the upper 1/3 of the frame to assess the clarity of the image.
 2. Due to variations in depth of field among different lenses, prioritize ensuring clarity in the lower 1/3 of the frame and the middle section of the frame when you encounter situations where it's not possible to achieve uniform clarity throughout the depth of the image.

5.2.3 Configuring Image Parameters

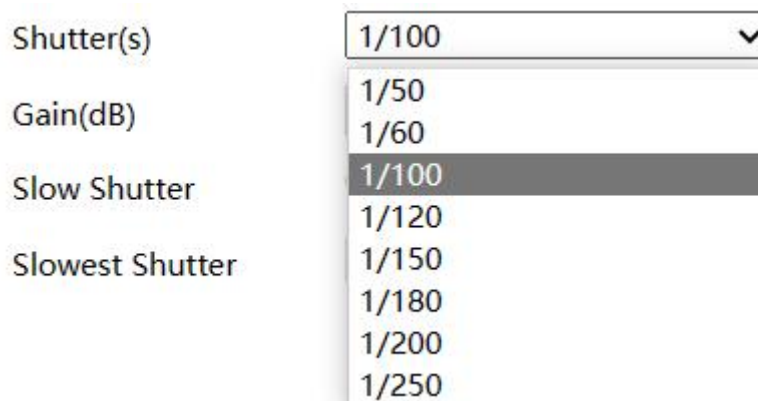
- The configuration options for image parameters mainly include scene selection, intelligent supplemental lighting, image enhancement, exposure parameters, white balance parameters, etc. The configuration parameters vary in different monitoring scenes and environments. Installation and debugging personnel can configure them according to the actual monitoring scene.
- As an example, let's consider a scenario for people counting:
 1. Access the WEB interface and go to Settings > Camera > Image Settings, then select "General."



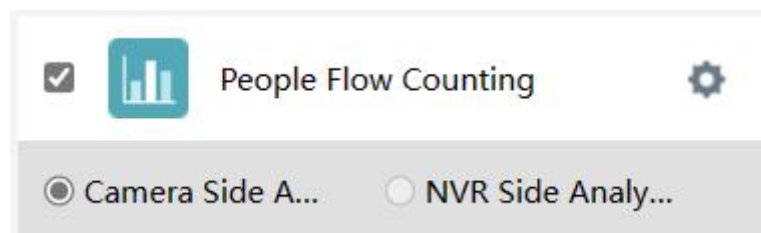
2. Under Settings > Camera > Exposure Parameters > Exposure Mode, choose "Low Motion Blur."





3. In Settings > Camera > Exposure Parameters > Shutter Time, select "1/100."



4. Navigate to Intelligent Surveillance > Intelligent Functions and enable the "People Flow Counting" function. Access the settings for this function.



5. Based on the scene requirements, choose the "Direction," "Counting Type," and "Report Interval," and define the position of the rule line.

Direction	<input type="text" value="B->A"/>
Counting Type	<input type="text" value="Total"/>
Report Interval(s)	<input type="text" value="60"/>
Clear by Schedule	<input type="radio"/> On <input checked="" type="radio"/> Off
	Finish Drawing
	Clear Counting Result

6. In Settings > Camera > OSD page, enable "People Flow Counting."

Show Time	<input checked="" type="radio"/> On <input type="radio"/> Off
Show Name	<input type="radio"/> On <input checked="" type="radio"/> Off
Count People	<input checked="" type="radio"/> On <input type="radio"/> Off
Date Format	<input type="text" value="yyyy-MM-dd"/>
Time Format	<input type="text" value="HH:mm:ss"/>
Font Size	<input type="text" value="Medium"/>
Font Color	<input type="text"/>

5.2.4 Configuring Local Parameters

- To configure local parameters, follow these steps:
 - Log in to the camera's web interface.
 - Under "Settings" > "Client," enable the "Intelligent Marking" feature.
 - Save your settings, and then you can view real-time detection frame information for your targets on the web live stream.

Default Live Stream	Sub Stream <input type="button" value="v"/>
Scale	Full <input type="button" value="v"/>
Video Mode	Fluency Priority <input type="button" value="v"/>
Video File Size	1 GB <input type="button" value="v"/>
Save File To	D:\
Live View Protocol	TCP <input type="button" value="v"/>
Intelligent Mark	<input checked="" type="radio"/> On <input type="radio"/> Off

5.3 User Acceptance Testing

User acceptance testing (UAT) is a crucial step in ensuring that the security surveillance solution meets user requirements and specifications. By conducting tests and validations on aspects such as image quality, functionality, and alarm triggering, the reliability of the solution can be assured.

Testing Items	Target Test Results
Functionality	Verify that video surveillance functions work correctly, including real-time monitoring, recording, and playback.
	Test remote access functionality to ensure that you can view surveillance video remotely.
Image Quality	Ensure that the live video feed displays clear images with accurate color reproduction.
Alarm	Simulate various types of alarm events, such as intrusion or fire alarms, to verify whether the system can accurately detect and respond to these events.
	Confirm the timeliness and accuracy of alarm notifications.

5.4 Handover

Handover ensures that the recipient receives sufficient information and guidance to smoothly take over and operate the system. This helps reduce operational and configuration errors, improves system stability and reliability, and ensures that the recipient can fully utilize the features and advantages of the security monitoring system.

- Provide an overview of the solution, system architecture, and topology diagram to ensure that the recipient has a comprehensive understanding of the solution.
- Provide a hardware equipment list and software with version information to ensure that the recipient has the correct device models and software versions. This facilitates future maintenance, upgrades, and expansions by the recipient.
- Provide user manuals and configuration guides to assist the recipient in correctly configuring and customizing the system to meet their needs.
- Provide contact information for post-sales support to help the recipient reach relevant personnel promptly when assistance or troubleshooting is needed.



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