

Sundarharaicha Municipality			
Office of the municipal executive			
Biratchowk, Morang			
Koshi Province, Nepal			
Specification of different IT equipments			
1. Technical Specification of i3 desktop computer			
	Particulars	Requirements	unit
	Manufacturer, Country		
	Brand	To be specified by bidders	pcs
	Model	To be specified by bidders	
	Processor	Intel Core i3-14100, min. 5 cores or equivalent	
	Memory	8 GB DDR5 (or DDR4), expandable preferable	
	Storage	512 GB PCIe NVMe SSD	
	Graphics	Integrated Graphics	
	Operating System	Genuine Windows 11 Pro	
	LAN	Integrated Gigabit Ethernet (RJ45)	
	Wireless	Wi-Fi 5/6 inbuilt or integrated after delivery	
	Ports	Minimum 4 USB ports, HDMI, VGA or DisplayPort, Audio, RJ45	
	Form Factor	Tower or Small Form Factor	
	Accessories	Same-brand USB Keyboard and Optical Mouse	
	Warranty	Minimum 1 year	
2. Technical Specification of i5 desktop computer			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Processor	Min. Intel Core i5 14400 (min. 10 cores, 16 threads, 2.50 GHz to 4.70 GHz Turbo, 65W) or equivalent	
	Memory / RAM	8 GB: 1 x 8 GB, DDR5, 4800 MT/s, UDIMM, single-channel	
	Storage	512 GB, PCIe NVMe, SSD	
	Operating System	Genuine Windows 11 Pro	
	Ports	Front: min. 2× USB 2.0 ports; 1×USB 3.2 Gen 1 Type-C port; 1× USB 3.2 Gen 1 port; 1× Global headset jack Rear: 2× USB 2.0 with SmartPower On ports; 2× USB 3.2 Gen 1 ports; 1× RJ45 Ethernet port (1 Gbps); 1× HDMI 2.1 port; 1× DisplayPort 1.4 port	
	Graphics	Integrated	
	BAYS	BAYS (2) Up to 2 bays; (1) HDD + (1) SSD	
	Form Factor	Tower or Small Form Factor	
	Accessories	Same-brand USB Keyboard and Optical Mouse	

	Warranty	min. 1 year	
3. Technical Specification of Photogrammetry work desktop computer			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Processor	Minimum 6 physical cores and 12 threads, x86-64 architecture, base clock ≥ 3.0 GHz with integrated graphics or equivalent	
	Dedicated Graphics	Dedicated GPU with minimum 8 GB GDDR6 VRAM, minimum 128-bit memory interface, support for DirectX 12/Vulkan or equivalent	
	Motherboard	Compatible with offered processor; minimum 2 RAM slots; minimum 1 $\times$ M.2 NVMe slot; USB 3.0 or higher; Gigabit LAN; HDMI/DisplayPort or equivalent; onboard audio	
	CPU Cooling	Compatible CPU cooling solution suitable for the offered processor and capable of maintaining stable operation under continuous workload	
	Memory	Minimum 16 GB DDR4/DDR5 RAM, preferably 2 $\times$ 8 GB; expandable to at least 32 GB	
	Storage	Minimum 512GB NVMe SSD, read speed greater than or equal to 2000 MB/s	
	Power Supply	Minimum 550 W or as required by the proposed configuration;	
	Cabinet	ATX/mATX compatible cabinet with adequate ventilation, minimum required cooling fans and sufficient expansion space	
	Keyboard	Standard USB keyboard	
	Mouse	Standard optical USB mouse, minimum 3 buttons with scroll wheel	
	Monitor	minimum 27 inch, > 80Hz, Ips or equivalent	
	Use case	GIS, Drone Mapping, Photogrammetry, 3D Modeling	
	Warranty	Minimum 1 year	
4. Technical Specification of i5 CPU			
16.1	Brand		pcs
16.2	Model		
16.3	Processor	Intel core i5 12th generation or equivalent	
16.4	RAM	8GB	
16.5	Storage	512 GB SSD	
16.6	Clock speed	2.4 GHz or higher	
16.7	Integrated graphics	Yes	
16.8	Warranty	1 year	
5. Technical Specification of i3 CPU			
	Brand		
	Model		

	Processor	Intel core i3 12th generation or equivalent	pcs
	RAM	8GB	
	Storage	512 GB SSD	
	Integrated graphics	Yes	
	Warranty	1 years	
6. Technical Specification of Laptop			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Processor	Intel core i5 120 U min. 8 cores or equivalent or higher	
	Graphics	Integrated	
	RAM	8 GB DDR5	
	Storage	512 GB PCIe NVMe SSD	
	Display	15.6 inch FHD, anti-glare	
	Refresh rate	min. 60 Hz	
	Audio	Yes	
	Wireless	Wifi and bluetooth	
	Interface	min. 2×USB-A, 1×USB-C, 1×HDMI,1×audio jack	
	Battery	min. 47Wh	
	Accessories	Power adapter,wireless mouse and other required accessories	
	Warranty	Mininum 1 year	
7. Technical Specification of Laptop			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Processor	Intel core 5 proccessor 120U, base frequency 1.4GHz,10 cores, 12 threads, or equivalent/higher	
	Display	14-inch Full HD (1920 × 1080) LED-backlit display, 16:9 aspect ratio, 60 Hz refresh rate, anti-glare, or higher	
	RAM	Minimum 8 GB DDR4 onboard memory	
	Storage	Minimum 256 GB M.2 NVMe™ PCIe® 4.0 SSD	
	Wireless	Wi-Fi 6 (802.11ax), dual-band, 1×1, with Bluetooth® 5.2 or higher	
	Web camera	720p HD camera or better	
	Interface	Minimum 1 × USB 2.0 Type-A, 1 × USB 3.2 Gen 1 Type-C, and 2 × USB 3.2 Gen 1 Type-A, 1 × HDMI 1.4 port	
	Audio port	at least 1 × 3.5 mm combined audio/headphone-microphone jack	
	Audio	Integrated audio system with built-in speakers and array microphone; SonicMaster or equivalent	
	Battery	Min. 42Wh	
	Accessories	Power adapter,wireless mouse and other required accessories	

	Warranty	Minimum 1 year	
8. Technical Specification of 19 inch Monitor			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Resolution	1360×768 or higher	
	Display size	19 inch	
	Refresh rate	60 Hz or higher	
	Color format	RGB	
	Warranty	1 years	
9. Technical specification of 24 inch monitor			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Display size	23.8 inches	
	Resolution	Full HD 1920×1080	
	Panel Type	IPS	
	Refresh rate	90 Hz or better	
	Ports	at least 2×HDMI	
	Built in speaker	Yes and minimum 2×4W speakers	
	Mount capability	Yes	
	Warranty	Minimum 1 year	
10. Technical specification of 32 inch monitor			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Screen Size	32 inches	
	Display Type	LED-backlit display	
	Resolution	Full HD, 1920 × 1080 pixels	
	Brightness	Minimum 350 cd/m ²	
	Viewing Angle	Minimum 178° horizontal and 178° vertical	
	Color Depth	8-bit or better	
	Contrast Ratio	Minimum 4000:1	
	Response Time	less than or equal to 8 ms	
	Refresh Rate	Minimum 60 Hz	
	Video Inputs	HDMI, VGA, DVI and CVBS or equivalent	
	Audio Input	Audio input supported	
	Audio Output	Built-in speakers, minimum 2 × 2 W or equivalent	
	USB Interface	Minimum 1 × USB 2.0	
	Control Interface	RS232 input and output	
	Power Supply	100–240 VAC, 50/60 Hz	
	Reliability	Suitable for continuous operation (24 × 7)	
	Warranty	Minimum 2 years	
11. Technical specification of 43 inch monitor			
	Manufacturer, Country		
	Brand		
	Model		
	Screen Size	43 inches	
	Display Type	LED-backlit display	

	Resolution	3840 × 2160 pixels (4K UHD)	pcs
	Refresh Rate	Minimum 60 Hz	
	Brightness	Minimum 350 cd/m ²	
	Viewing Angle	Minimum 178° horizontal and 178° vertical	
	Color Depth	8-bit + FRC or better	
	Contrast Ratio	Minimum 4000:1	
	Response Time	Maximum 7 ms	
	Video Inputs	Minimum 1 × HDMI, 1 × DisplayPort and 1 × VGA	
	Audio Input	Minimum 1 × Line-in	
	Audio Output	Built-in speakers, minimum 2 × 10 W	
	USB Interface	Minimum 1 × USB 2.0	
	Control Interface	RS232 input and output	
	Power Supply	100–240 VAC, 50/60 Hz	
	Mounting	VESA-compatible wall/mounting support	
	Warranty	Minimum 2 years	
12. Technical specification of 75 inch AI smart board			
	Manufacturer, Country		
	Brand		
	Model		
	Product Type	Interactive Flat Panel Display / Interactive Smart Board suitable for education, training, meetings and presentations	
	Screen Size	Minimum 75 inches	
	Display Technology	D-LED / Direct LED or better	
	Display Resolution	Minimum 3840 × 2160 pixels (4K UHD)	
	Brightness	Minimum 530 cd/m ²	
	Response Time	≤ 5 ms	
	Viewing Angle	Minimum 178° horizontal and 178° vertical	
	Color Depth	Minimum 10-bit	
	Contrast Ratio	Minimum 4500:1	
	LED Life	Minimum 50,000 hours	
	Touch Technology	Infrared (IR) or equivalent touch technology	
	Touch Points	Minimum 50 simultaneous touch points	
	Touch Response Time	≤ 4 ms	
	Touch Surface	Anti-glare and anti-fingerprint surface	
	Glass Bonding	Zero-bonding / full lamination or equivalent technology	
	Glass Hardness	Minimum 7H/Mohs equivalent, suitable for frequent educational use	
	Dust Protection	Minimum IP5X or equivalent dust protection	
	Operating System	Android 14 or later	
	RAM	Minimum 8 GB, expandable/virtual memory support where applicable	
	Internal Storage	Minimum 128 GB	
	Processor	Minimum 8-core high-performance processor, with at least 4 performance cores operating at approximately 2.4 GHz or higher, or equivalent/better performance	

	GPU	Integrated GPU capable of supporting 4K UHD graphics and interactive applications
	AI/NPU	Dedicated AI processing capability of minimum 4 TOPS or equivalent, where supported
	Wi-Fi	Dual-band 2.4 GHz and 5 GHz, minimum Wi-Fi 6 or better
	Bluetooth	Minimum Bluetooth 5.4 with BLE, or later
	NFC	Built-in NFC support
	Wireless Screen Sharing	Wireless screen mirroring from computers/mobile devices, supporting multiple-source display/split-screen functionality
	Reverse Touch/Control	Support reverse touch/control from the interactive panel to a connected compatible computer, where supported
	Speakers	Built-in speakers, minimum 2 × 10 W, with additional built-in loudspeaker/audio output capability
	Microphone	Built-in multi-array omnidirectional microphone with minimum 12 m pickup distance or equivalent
	Camera	Built-in 4K camera with auto-framing, speaker tracking and digital PTZ or equivalent AI-assisted camera functions
	Sensors	Built-in ambient light and environmental sensors such as temperature/humidity, where supported
	Audio Processing	Echo cancellation, noise reduction, automatic gain control, dereverberation and speech-processing functions
	Image Processing	Support for automatic white balance, 3D noise reduction, defogging/shadow correction and equivalent image-enhancement functions
	HDMI Input	Minimum 3 × HDMI, supporting 4K input; HDMI 2.0/2.1 or better
	HDMI Output	Minimum 1 × HDMI output
	VGA Input	Minimum 1 × VGA or equivalent legacy video input
	Audio Input	Minimum 1 × audio input
	Audio Output	Minimum 1 × audio output and/or SPDIF
	Touch USB	Minimum 3 × USB touch interfaces
	USB Ports	Minimum 3 × USB 3.0 or higher
	USB Type-C	Minimum 2 × USB Type-C, with at least one supporting up to 100 W power delivery/charging
	LAN	Minimum 2 × Gigabit Ethernet (10/100/1000 Mbps) ports

pcs

	Whiteboard	Built-in digital whiteboard with writing, annotation, erasing, object manipulation, page management, additional educational features
	Whiteboard Saving	Automatic/periodic saving or recovery mechanism to prevent loss of whiteboard content during unexpected shutdown or application exit
	Languages	User interface shall support English and Nepali languages
	Screen Recording	Built-in screen recording with synchronized audio and optional picture-in-picture camera recording
	User Accounts	Support for minimum 5 user accounts/profiles
	User Authentication	Support at least two or more authentication methods such as password, NFC, USB and/or facial recognition
	AI Functions	Built-in or integrated AI-assisted functions for education/productivity, such as speech-to-text/text-to-speech, content recognition, intelligent writing assistance and whiteboard assistance
	Presentation/Seminar Functions	Support content broadcasting, content scheduling, permission management and centralized control of connected screens/devices
	Centralized Management	Cloud/local management platform for centralized monitoring and management of one or multiple interactive panels
	Remote Management	Remote power control, scheduled shutdown, application management, firmware/software update, content/message broadcasting and remote device monitoring
	Remote Application Management	Ability to remotely install/update approved applications/APKs, subject to security and administrator permissions
	Remote Desktop/Control	Support remote desktop/control of the interactive panel through an authorized administrator platform
	Mounting	Suitable for wall mounting and/or compatible mobile floor stand; standard mounting arrangement shall be provided
	Accessories	Necessary power cable, touch/connection cables, wall mounting bracket and other standard accessories required for normal operation shall be included
	Service & Support	Supplier shall provide installation, configuration, testing and basic operational training where required

	Certifications	Product shall comply with applicable CE, CB, Energy Star or equivalent internationally recognized certification requirements
	Warranty	Minimum 2 years service and parts
13. Technical specification of 65 inch AI smart board		
	Manufacturer, Country	
	Brand	
	Model	
	Product Type	Interactive Flat Panel Display for Education, Training, and Presentation
	Screen Size	Minimum 65 inches
	Display Technology	Direct LED (D-LED) Technology or equivalent or better
	Display Resolution	Minimum 3840 × 2160 pixels (4K UHD)
	Brightness	Minimum 400 cd/m ²
	Response Time	≤ 5 ms
	Viewing Angle	Minimum 178° horizontal and 178° vertical
	Color Depth	Minimum 10-bit
	Contrast Ratio	greater than or equal to 5000:1
	Touch Technology	High-precision Infrared (IR) or equivalent optical touch technology
	Touch Points	Minimum 30 simultaneous touch points
	Touch Response Time	≤ 4 ms
	Glass Bonding	Zero-bonding / zero-gap lamination; Anti-glare tempered glass
	Dust Protection	Minimum IP5X or equivalent dust protection
	Operating System	Android 14 or later
	RAM	Minimum 8GB and expandable
	Internal Storage	Minimum 128 GB
	Processor	Minimum 8-core high-performance processor, with at least 4 performance cores operating at approximately 2.0 GHz or higher, or equivalent/better performance
	GPU	Integrated HD GPU
	AI/NPU	Hardware AI/NPU engine supported
	Wi-Fi	Dual-band 2.4 GHz and 5 GHz, minimum Wi-Fi 6 or better
	Bluetooth	Minimum Bluetooth 5.0 or later
	Wireless Screen Sharing	Wireless screen mirroring from compatible computers, tablets and smartphones; multi-source/split-screen capability preferred
	Reverse Touch/Control	Support touch/reverse control of compatible connected devices
	Speakers	Built-in speakers, minimum 2 × 10 W, with additional audio output capability
	Microphone	Built-in multi-array omnidirectional microphone with minimum 12 m pickup range or equivalent
	Camera	Built-in HD camera with auto-framing and speaker-tracking capability

	Audio Processing	Echo cancellation, dereverberation, automatic gain control, noise reduction and speech enhancement	pcs
	Image Processing	Support for automatic white balance, 3D noise reduction and other image-enhancement functions	
	HDMI Input	Minimum 3 × HDMI inputs, supporting 4K	
	HDMI Output	Minimum 1 × HDMI output	
	VGA Input	Minimum 1 × VGA input or equivalent video input	
	Audio Input	Minimum 1 × audio input	
	Audio Output	Minimum 1 × audio output and/or SPDIF	
	Touch USB	Minimum 3 × USB touch interfaces	
	USB Ports	Minimum 4 × USB 3.0 or higher	
	USB Type-C	Minimum 2 × USB Type-C, with at least one supporting up to 100 W charging/power delivery	
	LAN	Minimum 2 × 10/100/1000 Mbps Gigabit Ethernet ports	
	Whiteboard	Built-in digital whiteboard supporting writing, annotation, erasing, page management and content export	
	Whiteboard Saving	Automatic content saving/recovery mechanism to minimize loss during unexpected application/system exit	
	Languages	User interface shall support English and Nepali	
	Screen Recording	Screen recording with synchronized audio and optional picture-in-picture camera recording	
	User Accounts	Support for minimum 5 user profiles/accounts	
	User Authentication	Support for multiple authentication methods such as password, NFC, USB and/or facial recognition	
	AI Functions	AI-assisted productivity/education functions such as speech-to-text/text-to-speech, content recognition, intelligent writing assistance and whiteboard assistance	
	Presentation/Seminar Functions	Support content broadcasting, scheduling, permission management and centralized control of connected screens	
	Centralized Management	Centralized/local/cloud management platform for monitoring and management of one or multiple interactive panels	
	Remote Management	Authorized remote control including power scheduling, shutdown/restart, device monitoring and software/firmware management	

	Remote Application Management	Authorized remote control including power scheduling, shutdown/restart, device monitoring and software/firmware management, remote installation/update of approved applications, subject to administrator/security controls
	Remote Desktop/Control	Authorized remote desktop/control capability through the management platform
	Mounting	Suitable for wall mounting and/or compatible mobile floor stand; standard mounting arrangement shall be provided
	Service & Support	Supplier shall provide installation, configuration, testing and basic operational training where required
	Accessories	Power cable, HDMI cable, USB touch cable, wall-mounting bracket and all standard accessories necessary for operation shall be supplied
	Certifications	Product shall comply with applicable CE, CB, Energy Star or equivalent internationally recognized certification requirements
	Warranty	Minimum 2 years service and parts
14. Technical specification of 65 inch interactive flat panel		
	Manufacturer, Country	
	Brand	
	Model	
	Product	Interactive Flat Panel Display suitable for classroom, training, meeting and presentation purposes
	Screen Size	Minimum 65 inches
	Display Technology	Direct LED (D-LED) or equivalent/better
	Resolution	Minimum 3840 × 2160 pixels (4K UHD) @ 60 Hz
	Brightness	Minimum 400 cd/m ²
	Color Depth	Minimum 10-bit or equivalent
	Response Time	≤ 6 ms
	Contrast Ratio	Minimum 5000:1 static or equivalent/better
	Refresh Rate	Minimum 60 Hz
	Viewing Angle	Minimum 178° horizontal / 178° vertical
	Aspect Ratio	16:09
	Surface	Anti-glare glass suitable for prolonged interactive use
	Glass Bonding	Zero-bonding/full lamination or equivalent technology
	Operating Duty	Suitable for minimum 16 hours/day, 7 days/week operation
	Touch Technology	Infrared (IR) or equivalent professional interactive touch technology
	Touch Points	Minimum 40 simultaneous touch points
	Touch Response	≤ 6 ms

	Touch Object Recognition	Support recognition of touch objects/stylus of approximately 1.5 mm or smaller, or equivalent
	Operating System	Android 14 or later, or equivalent current certified smart-panel operating platform
	RAM	Minimum 8 GB
	Internal Storage	Minimum 128 GB
	Processor	Minimum 8-core high-performance processor, suitable for 4K multimedia, interactive applications and multitasking
	Camera	Built-in camera, minimum 4K video resolution
	Camera Functions	Auto-framing and/or speaker tracking or equivalent intelligent conferencing functions
	Microphone	Built-in multi-array omnidirectional microphone
	Microphone Pickup	Minimum 12 m pickup distance or equivalent
	Audio Processing	Echo cancellation/reduction and intelligent noise reduction
	Speakers	Built-in speakers, minimum 2 × 20 W
	Bluetooth	Minimum Bluetooth 5.0, preferably 5.4 or later
	Light Sensor	Built-in ambient light sensor
	Image Processing	Support automatic white balance, 3D noise reduction, face detection and other standard image-enhancement functions
	HDMI Input	Minimum 3 × HDMI inputs, supporting 4K
	HDMI Output	Minimum 1 × HDMI output or equivalent digital video output
	Audio Input	Minimum 1 × audio input
	Audio Output	Minimum 1 × audio output and/or digital audio output
	Touch Interface	Minimum 2 × USB touch interfaces
	USB Ports	Minimum 4 × USB ports, including at least 2 × USB 3.0 or higher
	USB Type-C	Minimum 1 × USB Type-C supporting data, video and touch functionality
	LAN	Minimum 2 × Gigabit Ethernet (10/100/1000 Mbps) ports
	Wi-Fi	Dual-band 2.4 GHz/5 GHz, minimum Wi-Fi 6, with 2×2 MIMO or better
	Wireless Screen Sharing	Wireless screen mirroring from compatible Windows, Android, iOS/macOS or equivalent devices
	RS-232	Minimum 1 × RS-232 or equivalent control interface
	Whiteboard	Built-in digital whiteboard with writing, annotation, erasing, page management and content export/save

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	Whiteboard Recovery	Automatic saving/recovery mechanism to minimize loss of content during unexpected shutdown/application exit
	Screen Recording	Screen recording with synchronized audio; camera picture-in-picture capability preferred
	User Accounts	Support minimum 5 user accounts/profiles
	User Authentication	Support multiple authentication methods such as password, NFC, USB and/or biometric authentication
	Language	Support English; Nepali language support is preferred/required if intended for local deployment
	Centralized Management	Software platform for centralized monitoring and management of multiple interactive panels
	Remote Management	Authorized remote power control, scheduled shutdown, device monitoring and software/firmware management
	Content Management	Ability to remotely distribute/broadcast approved text, images and video content to connected panels
	Application Management	Ability to manage/update approved applications remotely, subject to administrator permissions
	Remote Support	Authorized remote troubleshooting/desktop support capability
	Security	User/admin access control and secure system management features
	Power Supply	100–240 VAC, 50/60 Hz
	Power Consumption	Energy-efficient design; standby consumption preferably ≤ 0.5 W
	Mounting	compatible mounting
	Accessories	Wall-mounting bracket, power cable, required touch/data cables and standard accessories necessary for operation
	Certification	Applicable CE, CB, Energy Star or equivalent internationally recognized certification shall be provided
	Warranty	Minimum 2 years comprehensive warranty
15. Technical specification of 75 inch interactive flat panel		
	Manufacturer, Country	
	Brand	
	Model	
	Product	Interactive Flat Panel Display suitable for classroom, training, meeting and presentation purposes
	Screen Size	Minimum 75 inches
	Display Technology	Direct LED (D-LED) or equivalent/better
	Resolution	Minimum 3840 × 2160 pixels (4K UHD)

	Brightness	Minimum 400 cd/m ²
	Color Depth	Minimum 10-bit or equivalent
	Response Time	≤ 6 ms
	Contrast Ratio	Minimum 5000:1 static or equivalent/better
	Refresh Rate	Minimum 60 Hz
	Viewing Angle	Minimum 178° horizontal / 178° vertical
	Aspect Ratio	16:09
	Surface	Anti-glare glass suitable for prolonged interactive use
	Glass Bonding	Zero-bonding/full lamination or equivalent technology
	Operating Duty	Suitable for minimum 16 hours/day, 7 days/week operation
	Touch Technology	Infrared (IR) or equivalent professional interactive touch technology
	Touch Points	Minimum 40 simultaneous touch points
	Touch Response	≤ 6 ms
	Touch Object Recognition	Support recognition of touch objects/stylus of approximately 1.5 mm or smaller, or equivalent
	Operating System	Android 14 or later, or equivalent current certified smart-panel operating platform
	RAM	Minimum 8 GB
	Internal Storage	Minimum 128 GB
	Processor	Minimum 8-core high-performance processor, suitable for 4K multimedia, interactive applications and multitasking
	Camera	Built-in camera, minimum 4K video resolution
	Camera Functions	Auto-framing and/or speaker tracking or equivalent intelligent conferencing functions
	Microphone	Built-in multi-array omnidirectional microphone
	Microphone Pickup	Minimum 12 m pickup distance or equivalent
	Audio Processing	Echo cancellation/reduction and intelligent noise reduction
	Speakers	Built-in speakers, minimum 2 × 20 W
	Bluetooth	Minimum Bluetooth 5.0, preferably 5.4 or later
	Light Sensor	Built-in ambient light sensor
	Image Processing	Support automatic white balance, 3D noise reduction, face detection and other standard image-enhancement functions
	HDMI Input	Minimum 3 × HDMI inputs, supporting 4K
	HDMI Output	Minimum 1 × HDMI output or equivalent digital video output
	Audio Input	Minimum 1 × audio input
	Audio Output	Minimum 1 × audio output and/or digital audio output
	Touch Interface	Minimum 2 × USB touch interfaces

	USB Ports	Minimum 4 × USB ports, including at least 2 × USB 3.0 or higher
	USB Type-C	Minimum 1 × USB Type-C supporting data, video and touch functionality
	LAN	Minimum 2 × Gigabit Ethernet (10/100/1000 Mbps) ports
	Wi-Fi	Dual-band 2.4 GHz/5 GHz, minimum Wi-Fi 6, with 2×2 MIMO or better
	Wireless Screen Sharing	Wireless screen mirroring from compatible Windows, Android, iOS/macOS or equivalent devices
	RS-232	Minimum 1 × RS-232 or equivalent control interface
	Whiteboard	Built-in digital whiteboard with writing, annotation, erasing, page management and content export/save
	Whiteboard Recovery	Automatic saving/recovery mechanism to minimize loss of content during unexpected shutdown/application exit
	Screen Recording	Screen recording with synchronized audio; camera picture-in-picture capability preferred
	User Accounts	Support minimum 5 user accounts/profiles
	User Authentication	Support multiple authentication methods such as password, NFC, USB and/or biometric authentication
	Language	Support English; Nepali language support is preferred/required if intended for local deployment
	Centralized Management	Software platform for centralized monitoring and management of multiple interactive panels
	Remote Management	Authorized remote power control, scheduled shutdown, device monitoring and software/firmware management
	Application Management	Ability to manage/update approved applications remotely, subject to administrator permissions
	Remote Support	Authorized remote troubleshooting/desktop support capability
	Security	User/admin access control and secure system management features
	Power Supply	100–240 VAC, 50/60 Hz
	Power Consumption	Energy-efficient design; standby consumption preferably ≤ 0.5 W
	Operating Temperature	Suitable for at least 0°C to 40°C
	Mounting	Compatible mounting

	Accessories	Wall-mounting bracket, power cable, required touch/data cables and standard accessories necessary for operation
	Certification	Applicable CE, CB, Energy Star or equivalent internationally recognized certification shall be provided
	Warranty	Minimum 2 years comprehensive warranty
16. Technical specification of 65 inch interactive smart board		
	Manufacturer, Country	
	Brand	
	Model	
	Product Type	65-inch or larger Interactive Flat Panel Display suitable for classroom teaching, training, meetings and presentations
	Screen Size	Minimum 65 inches
	Backlight	D-LED / Direct LED or equivalent
	Display Surface	Anti-glare, tempered/toughened glass suitable for frequent interactive use
	Resolution	Minimum 3840 × 2160 pixels (4K UHD)
	Brightness	Minimum 400 cd/m ²
	Contrast Ratio	Minimum 3000:1 static or equivalent/better
	Response Time	≤ 6 ms
	Viewing Angle	Minimum 178° horizontal / 178° vertical
	Aspect Ratio	16:09
	Display Life	Minimum 50,000 hours
	Color Performance	Support minimum 10-bit color processing/display or equivalent
	Display Mode	Support standard display modes such as normal, soft/user-defined and dynamic or equivalent
	Display Area	Appropriate active display area for a 65-inch 16:9 panel
	Operating System	Built-in Android operating system, Android 13 or later, or equivalent current supported version
	RAM	Minimum 8 GB
	Internal Storage	Minimum 128 GB
	Processor	Minimum 8-core high-performance processor suitable for 4K multimedia, interactive applications and multitasking; equivalent or better architecture shall be accepted
	Graphics	Integrated graphics processor capable of supporting 4K UHD display and multimedia applications
	Touch Technology	Infrared (IR) or equivalent professional interactive touch technology
	Touch Points	Minimum 20 simultaneous touch points

	Touch Input	Support touch using finger and passive/active stylus or equivalent opaque touch objects
	Minimum Touch Object	Shall support recognition of touch objects of approximately 5 mm or smaller
	Touch Accuracy	$\leq \pm 2$ mm over at least 95% of the touch area, or better
	Touch Stability	Touch position shall remain stable without noticeable drift during normal operation
	Camera	Built-in camera, minimum 8 MP with video capability suitable for online teaching/video conferencing
	Camera Functions	Support standard video-conferencing functions; auto-framing/speaker tracking or equivalent functions are preferred
	Microphone	Built-in microphone array with minimum 8 m voice pickup distance or equivalent
	Audio	Built-in speakers suitable for classroom/meeting use
	Audio Processing	Support echo reduction/cancellation and noise reduction
	HDMI Input	Minimum 2 × HDMI inputs, supporting 4K signal
	VGA Input	Minimum 1 × VGA input or equivalent digital/legacy video input
	Audio Input	Minimum 1 × audio input
	USB	Minimum 3 × USB ports for peripheral/data connectivity
	USB Version	At least 2 × USB 3.0 or higher
	Touch USB	Minimum 1 × USB touch interface
	LAN	Minimum 1 × RJ-45 Gigabit Ethernet (10/100/1000 Mbps)
	Wireless Connectivity	Built-in dual-band Wi-Fi supporting 2.4 GHz and 5 GHz
	Bluetooth	Built-in Bluetooth 5.0 or later
	Additional Storage	TF/microSD card slot or equivalent removable storage interface is preferred
	Wireless Screen Sharing	Support wireless screen mirroring/casting from compatible computers, tablets and smartphones
	Signal Source Selection	Support automatic and manual selection/switching between available input sources
	Multi-Source Support	Support multiple signal sources and split-screen/multi-window display where available
	Dual-System Support	Where an OPS/PC module is installed, the panel shall support convenient switching between the built-in smart platform and OPS/PC environment

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	Energy Saving	Support automatic sleep/standby and scheduled power-off/energy-saving functions
	Channel/Source Memory	Shall retain or restore the last-used input/source setting after restart, where supported
	Whiteboard	Built-in interactive whiteboard supporting writing, annotation, erasing, page management and saving/exporting content
	Remote Control	Wireless/IR remote control shall be supplied
	Interface Protection	Front/side interfaces shall have suitable protection or lockable/covered design to reduce unauthorized access or accidental damage
	Operating System Compatibility	Shall support connection with commonly used operating systems including Windows and Linux, through standard interfaces/protocols
	Keyboard/Shortcut Functions	Common computer control/shortcut functions may be provided through remote control or connected keyboard; proprietary function keys shall not be mandatory
	Child/Panel Lock	Shall provide administrator/panel lock or equivalent access-control function
	Power Supply	Suitable for 100–240 V AC, 50/60 Hz mains supply
	Power Saving	Energy-efficient design with automatic standby/sleep capability
	Working Temperature	Minimum 0°C to 40°C
	Mounting	Wall-mount compatible; standard mounting arrangement/bracket shall be supplied
	Accessories	Remote controller, power cable, touch pen/stylus, wall-mounting bracket and all necessary standard cables/accessories shall be included
	Certification	Product shall comply with applicable CE, CB, Energy Star or equivalent internationally recognized certification requirements, with supporting documents
	Warranty	Minimum 2 years comprehensive warranty
17. Technical specification of 75 inch interactive smart board		
	Manufacturer, Country	
	Brand	
	Model	
	Product Type	Interactive Flat Panel Display (IFPD), suitable for education, training, meetings and presentation
	Screen Size	75 inches minimum
	Display Technology	IPS or better
	Resolution	Minimum 3840×2160

	Brightness	Minimum 350 cd/meter square	pcs
	Contrast Ratio	Minimum 4000:1	
	Viewing Angle	178 degree Horizontal/Vertical	
	Touch Technology	IR multi-touch or better	
	Touch Points	minimum 20 simultaneous touch points	
	Response Time	≤ 8 ms	
	Surface Protection	Anti-glare tempered glass, minimum 3mm	
	Operating System	Android 13 or higher	
	RAM	Minimum 8GB	
	Internal Storage	Minimum 128GB	
	CPU	Octa core processor	
	Connectivity	HDMI, USB 3.0, USB Type-C, LAN, WiFi, Bluetooth	
	Wireless sharing	Support wireless screen sharing from windows/Android/iOS	
	Audio	Built in speaker min, 15W×2	
	Accessories	Stylus pen(min. 2), Wall Mount Kit, Power Cable	
	Camera and Mic	Inbuilt or external compatible	
	OPS Support	Must support optional OPS PC module	
	Certification	CE/FCC/RoHS/ISO Certified	
	Warranty	Minimum 2 years manufacturer/supplier warranty	
18. Technical Specifications of OPS			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Operating system	windows 10 or higher	
	Processor	intel core i7 11 gen or higher	
	RAM	8GB or higher	
	storage	256 GB or higher	
	interfae	Rj45*1 bluetooth, USB 3.0, HDMI	
	Product Warranty	One Year, Onsite Service	
19. Technical specification of Attendance device			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Authentication Type	Face, Fingerprint and card	
	Face Capacity	2000 or more	
	Fingerprint Capacity	3000 or more	
	ID Card Capacity	3000 or more	
	Record Capacity	100000 or more	
	Communion	TCP/IP, USB-Host, Wifi	
	Standard functions	SMS, DTS, Scheduled-bell, Self-Service Query, Automatic status switch, T9 Input	
	Built in Backup battery	Yes, more than or equal to 2000 mAh	
	Verification time	less than or equal to 1 sec	
	Display screen	4 to 4.5 inch	
	Warranty	Min. 1 year	
20. Technical Specification of 2MP audio dome camera			

	Manufacturer, Country		pcs
	Brand		
	Model		
	Camera Type	IP Network Dome Camera	
	Image Sensor	Progressive Scan CMOS, $\geq 1/2.9$ inch	
	Effective Resolution	≥ 2 MP, minimum 1920×1080	
	Minimum Illumination	Color: ≤ 0.003 Lux; B/W: 0 Lux with IR	
	Day/Night	IR Cut Filter with Auto/Day/Night/Schedule modes	
	Lens	Fixed focal lens, 2.8 mm, M12 or equivalent	
	Aperture	F1.6 or better	
	Field of View	Horizontal FOV $\geq 84^\circ$ or equivalent coverage	
	IR / Supplementary Light	IR and/or white light; effective range ≥ 30 m	
	Smart Illumination	Smart/Adaptive supplementary lighting supported	
	Video Frame Rate	≥ 25 fps at 1920×1080	
	Video Compression	H.265/H.265+, H.264/H.264+ or equivalent	
	Bit Rate Control	CBR and VBR	
	ROI	Supported	
	Image Enhancement	BLC, HLC, 3D DNR or equivalent	
	WDR	WDR/Digital WDR supported	
	Privacy Mask	≥ 4 programmable privacy masks	
	Audio	Built-in microphone; audio recording supported	
	Audio Compression	G.711/G.726/AAC or equivalent	
	Network Interface	1 $\times$ RJ45 10/100 Mbps Ethernet port	
	Network Protocols	TCP/IP, IPv4/IPv6, HTTP/HTTPS, RTSP, RTP/RTCP, DHCP, DNS, NTP, SMTP and equivalent	
	ONVIF	ONVIF Profile S/T or equivalent interoperability	
	User Management	≥ 3 levels of user access with password protection	
	Smart Events	Line crossing, intrusion detection, region entrance/exiting; human/vehicle classification preferred	
	Power Supply	12 VDC and IEEE 802.3af PoE	
	Power Consumption	≤ 8 W	
	Operating Temperature	At least -30°C to $+60^\circ\text{C}$	
	Humidity	Up to 95% RH, non-condensing or better	
	Protection	IP67 or better	
	General Features	Heartbeat, mirror, anti-banding, password protection and password recovery	
	Compliance	CE/FCC or equivalent applicable certification	
	Warranty	Minimum 2 years	
21. Technical Specification of 2MP non audio dome camera			
	Manufacturer, Country		

	Brand		pcs
	Model		
	Camera Type	2MP IP Network Dome Camera	
	Image Sensor	Progressive Scan CMOS, minimum 1/2.9" or better	
	Resolution	Minimum 2 MP (1920 × 1080)	
	Minimum Illumination	Color: ≤0.01 Lux; B/W: 0 Lux with IR	
	Day/Night	IR Cut Filter with Auto/Day/Night/Schedule	
	Lens	Fixed focal lens, approximately 2.8–4 mm or equivalent	
	Field of View	Horizontal FOV ≥80° or equivalent	
	Aperture	F2.0 or better	
	IR Illumination	IR, effective range ≥30 m	
	Smart IR	Supported	
	Video Frame Rate	≥25 fps at 1920 × 1080	
	Video Compression	H.265/H.264 or better, including applicable profiles	
	ROI	Supported	
	WDR	WDR/Digital WDR; ≥120 dB preferred	
	Image Enhancement	BLC, HLC, 3D DNR or equivalent	
	Privacy Mask	Minimum 4 programmable privacy masks	
	Network Interface	1 × RJ45 10/100 Mbps Ethernet	
	ONVIF	ONVIF Profile S/T or equivalent	
	Network Protocols	TCP/IP, IPv4/IPv6, HTTPS, RTSP/RTP, DHCP, DNS, NTP and equivalent	
	User Management	Minimum 3 user levels with password protection	
	Smart Events	Line crossing and intrusion detection; human/vehicle classification preferred	
	Alarm/Event Linkage	FTP/e-mail/notification/triggered recording or equivalent	
	Power	12 VDC and IEEE 802.3af PoE or better	
	Power Consumption	≤8 W	
	Operating Temperature	At least -30°C to +60°C	
	Humidity	Up to 95% RH, non-condensing or better	
	Protection	IP67 and IK08 or better	
	Compliance	CE/RoHS or equivalent applicable certification	
	Warranty	Minimum 2 years	
22. Technical Specification of 2MP audio bullet camera(color)			
	Manufacturer, Country		
	Brand		
	Model		
	Camera Type	IP Network Bullet Camera	
	Image Sensor	Progressive Scan CMOS, minimum 1/2.8" or better	
	Resolution	Minimum 2 MP (1920 × 1080)	
	Minimum Illumination	Color: ≤0.0005 Lux @ F1.0, AGC ON or better; 0 Lux with supplementary illumination	

	Day/Night	IR Cut Filter with Day/Night/Auto/Schedule modes	pcs
	Lens	Fixed focal lens, approximately 2.8–4 mm or equivalent	
	Field of View	Horizontal FOV $\geq 88^\circ$ or equivalent	
	Aperture	F1.0 or better	
	Supplementary Illumination	IR and white light	
	Illumination Range	Minimum 30 m	
	Smart Supplementary Light	Supported	
	Video Frame Rate	≥ 25 fps at 1920×1080	
	Video Compression	H.265/H.264 or better	
	Bit Rate Control	CBR and VBR	
	ROI	Supported	
	Audio	Built-in microphone; audio recording supported	
	Audio Compression	Standard audio codecs such as G.711/AAC or equivalent	
	Noise Reduction	Environmental noise filtering supported	
	Network Interface	1 $\times$ RJ45 10/100 Mbps Ethernet	
	Network Protocols	TCP/IP, IPv4/IPv6, DHCP, DNS, HTTP/HTTPS, RTSP/RTP, NTP, IGMP and equivalent	
	ONVIF	ONVIF Profile S, T and/or G or equivalent	
	WDR	Minimum 120 dB WDR	
	Image Enhancement	BLC, HLC, 3D DNR or equivalent	
	Image Settings	Brightness, contrast, saturation, sharpness, white balance, gain and image orientation adjustment	
	Privacy Mask	Programmable privacy masking	
	Smart Events	Line crossing, intrusion, region entrance and region exiting detection	
	Target Classification	Human and vehicle target classification	
	Event Linkage	Alarm/recording/FTP/e-mail/notification or equivalent	
	Power Supply	12 VDC and IEEE 802.3af PoE	
	Power Consumption	≤ 8 W	
	Protection	IP67 or better	
	Operating Temperature	Preferably at least -30°C to $+60^\circ\text{C}$	
	Warranty	Minimum 2 years	
23. Technical Specification of 2MP fixed dome audio camera(color)			
	Manufacturer, Country		
	Brand		
	Model		
	Camera Type	IP Network Dome Camera	
	Image Sensor	Progressive Scan CMOS, minimum 1/2.8" or better	
	Resolution	Minimum 2 MP (1920×1080)	

	Minimum Illumination	Color: ≤ 0.0005 Lux @ F1.0, AGC ON or better; 0 Lux with supplementary illumination	pcs
	Day/Night	IR Cut Filter with Day/Night/Auto/Schedule modes	
	Lens	Fixed focal lens, approximately 2.8–4 mm or equivalent	
	Field of View	Horizontal FOV $\geq 88^\circ$ or equivalent	
	Aperture	F1.0 or better	
	Supplementary Illumination	IR and white light	
	Illumination Range	Minimum 30 m	
	Smart Supplementary Light	Supported	
	Video Frame Rate	≥ 25 fps at 1920×1080	
	Video Compression	H.265/H.264 or better	
	Bit Rate Control	CBR and VBR	
	ROI	Supported	
	Audio	Built-in microphone; audio recording supported	
	Audio Compression	Standard audio codecs such as G.711/AAC or equivalent	
	Noise Reduction	Environmental noise filtering supported	
	Network Interface	1 $\times$ RJ45 10/100 Mbps Ethernet	
	Network Protocols	TCP/IP, IPv4/IPv6, DHCP, DNS, HTTP/HTTPS, RTSP/RTP, NTP, IGMP and equivalent	
	ONVIF	ONVIF Profile S, T and/or G or equivalent	
	WDR	Minimum 120 dB WDR	
	Image Enhancement	BLC, HLC, 3D DNR or equivalent	
	Image Settings	Brightness, contrast, saturation, sharpness, white balance, gain and image orientation adjustment	
	Privacy Mask	Programmable privacy masking	
	Smart Events	Line crossing, intrusion, region entrance and region exiting detection	
	Target Classification	Human and vehicle target classification	
	Event Linkage	Alarm/recording/FTP/e-mail/notification or equivalent	
	Power Supply	12 VDC and IEEE 802.3af PoE	
	Power Consumption	≤ 8 W	
	Protection	IP67 or better	
	Operating Temperature	Preferably at least -30°C to $+60^\circ\text{C}$	
	Warranty	Minimum 2 years	
24. Technical Specification of 4MP bullet audio camera			
	Manufacturer, Country		
	Brand		
	Model		
	Camera Type	4MP Outdoor/Indoor Mini Bullet IP Camera with IR/White Light and Audio	

	Image Sensor	Minimum 1/2.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 2560 × 1440 (4MP)
	Minimum Illumination	Color: ≤0.0005 Lux @ F1.0, AGC ON, or better; 0 Lux with supplementary illumination
	Shutter Speed	Automatic/manual shutter speed with range of at least 1 s to 1/100,000 s or equivalent
	Day/Night	Automatic Day/Night switching with IR-cut filter
	Camera Adjustment	Pan: approximately 0–360°, Tilt: approximately 0–90°, Rotation: approximately 0–360°
	Lens Type	Fixed focal lens, approximately 2.8 mm or 4 mm, or equivalent
	Lens Mount	M12 or equivalent
	Iris	Fixed iris
	Aperture	F1.0 or better
	Supplementary Illumination	IR and/or white light, with intelligent/smart illumination control
	Illumination Distance	Minimum 30 meters
	IR Wavelength	Approximately 850 nm
	Main Stream Frame Rate	Minimum 25 fps at 2560 × 1440 at 50 Hz, or equivalent performance
	Video Compression	H.265/H.265+, H.264/H.264+ or equivalent efficient compression technology
	Bit Rate Control	CBR and VBR
	Region of Interest	ROI functionality supported for main/sub-stream
	Audio	Built-in microphone with audio recording capability
	Audio Compression	Support for G.711 and/or AAC or equivalent
	Audio Features	Noise reduction/filtering supported
	Video Streaming	Support for simultaneous main stream and sub-stream
	ONVIF	ONVIF Profile S/T/G or equivalent interoperability
	Image Adjustment	Brightness, contrast, saturation, sharpness, gain, white balance, AGC and other standard image adjustments
	Day/Night Mode	Day, Night, Auto and Schedule modes
	WDR	Minimum 120 dB WDR
	Image Enhancement	BLC, HLC and 3D DNR or equivalent
	SNR	≥52 dB or equivalent low-noise performance
	Privacy Mask	Minimum 4 programmable privacy mask regions
	Ethernet Interface	Minimum 1 × RJ45 10/100 Mbps adaptive Ethernet port
	Smart Detection	Minimum line crossing, intrusion, region entrance and region exiting detection

pcs

	Target Classification	Human and vehicle classification for supported smart events
	Event Linkage	Recording, image capture, FTP/NAS upload, email notification and central monitoring/management notification
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP, SMTP and other standard IP protocols
	Power Supply	12 VDC and IEEE 802.3af PoE or better
	Power Consumption	Maximum 8 W under normal operating conditions
	Construction	Durable metal body/front cover/bracket suitable for school environment
	Operating Temperature	At least -30°C to +60°C
	Operating Humidity	Up to 95% RH, non-condensing, or better
	Protection Rating	IP67 and IK10 or better
	Security	Password protection, secure user authentication and password recovery mechanism
	General Features	Anti-banding, mirror/rotation, heartbeat and other standard camera health-monitoring functions
	Management	Configuration and monitoring through web interface/VMS/NVR
	Warranty	Minimum 2 years
25. Technical Specification of 4MP dome audio camera		
	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	4MP IP Dome Camera with Two-Way Audio, IR/White Light and AI-based detection
	Image Sensor	Minimum 1/2.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 2560 × 1440 (4MP)
	Minimum Illumination	Color: ≤0.0005 Lux @ F1.0, AGC ON, or better; 0 Lux with supplementary illumination
	Shutter Speed	Range covering at least 1 s to 1/10,000 s or better
	Day/Night	Automatic Day/Night switching with IR-cut filter
	Camera Adjustment	Pan approximately 0–360°, Tilt approximately 0–75° or better, Rotation approximately 0–360°
	Lens	Fixed focal lens, approximately 2.8 mm, or equivalent
	Horizontal FOV	Minimum approximately 84°, or wider
	Lens Mount	M12 or equivalent
	Iris	Fixed

	Aperture	F1.0 or better
	Supplementary Light	IR and white light with intelligent/smart illumination control
	Supplementary Light Distance	Minimum 30 m
	IR Wavelength	Approximately 850 nm
	Main Stream	Minimum 25 fps at 2560 × 1440 at 50 Hz, or equivalent
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	H.264/H.265 Profile	Standard profiles appropriate for high-quality IP video transmission
	Bit Rate Control	CBR and VBR
	ROI	ROI supported for video streams
	Audio	Two-way audio communication
	Microphone	Built-in microphone
	Speaker	Built-in speaker suitable for two-way communication
	Audio Compression	Support for G.711 and/or AAC or equivalent
	Audio Sampling	Minimum 8 kHz, with higher sampling supported where applicable
	Noise Reduction	Environmental/background noise filtering or equivalent
	WDR	Minimum 120 dB WDR
	Image Enhancement	BLC, HLC and 3D DNR or equivalent
	SNR	≥52 dB or equivalent
	Privacy Mask	Minimum 4 programmable privacy mask regions
	Network Interface	Minimum 1 × RJ45 10/100 Mbps adaptive Ethernet port
	On-board Storage	Built-in microSD/microSDHC/microSDXC card slot, supporting at least 256 GB
	ONVIF	ONVIF Profile S/T/G or equivalent
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP, SMTP and other standard IP protocols
	Day/Night Control	Day, Night, Auto and Schedule modes
	Smart Detection	Minimum line crossing, intrusion, region entrance and region exiting detection
	Target Classification	Human and vehicle classification for supported smart events
	Alarm/Linkage	Recording, image capture, FTP/NAS upload, email/central monitoring notification and other standard event linkage
	Flashing/Warning Light	White-light warning/visual alarm functionality
	Reset	Physical reset facility
	Power Supply	12 VDC and IEEE 802.3af PoE or better
	Power Consumption	Maximum 10 W or better under normal operation

pcs

	Operating Temperature	At least -30°C to +60°C
	Operating Humidity	Up to 95% RH, non-condensing, or better
	Protection	Minimum IP67 or better
	Housing	Durable vandal-resistant dome housing suitable for indoor/outdoor school environments
	Management	Configuration and monitoring through web interface and compatible NVR/VMS
	Warranty	Minimum 2 years
26. Technical Specification of 4MP bullet audio camera(two way)		
	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	4MP IP Bullet Camera with Two-Way Audio, IR/White Light and AI-based Perimeter Detection
	Image Sensor	Minimum 1/2.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 2560 × 1440 (4MP)
	Minimum Illumination	Color: ≤0.001 Lux @ F1.0, AGC ON, or better; 0 Lux with supplementary illumination
	Shutter Speed	Range covering at least 1 s to 1/100,000 s or better
	Day/Night	Automatic Day/Night switching with IR-cut filter
	Camera Adjustment	Pan approximately 0–360°, Tilt approximately 0–90°, Rotation approximately 0–360°
	Lens Type	Fixed focal lens, approximately 2.8 mm or 4 mm, or equivalent
	Horizontal Field of View	Minimum approximately 84°, or equivalent/wider
	Lens Mount	M12 or equivalent
	Iris	Fixed iris
	Aperture	F1.0 or better
	Supplementary Illumination	IR and white light with intelligent/smart illumination control
	Supplementary Light Range	Minimum 30 meters
	IR Wavelength	Approximately 850 nm
	Main Stream	Minimum 25 fps at 2560 × 1440 at 50 Hz, or equivalent performance
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	Video Bit Rate Control	CBR and VBR
	ROI	Region of Interest (ROI) functionality supported
	Audio	Two-way audio communication

	Microphone	Built-in microphone	pcs
	Speaker	Built-in speaker suitable for two-way voice communication	
	Audio Compression	Support for G.711 and/or AAC, or equivalent	
	Audio Sampling	Minimum 8 kHz	
	Audio Noise Reduction	Environmental/background noise filtering or equivalent	
	WDR	Minimum 120 dB	
	SNR	≥52 dB, or equivalent low-noise performance	
	Image Enhancement	BLC, HLC and 3D DNR or equivalent	
	Privacy Mask	Minimum 4 programmable privacy mask regions	
	Network Interface	Minimum 1 × RJ45 10/100 Mbps adaptive Ethernet port	
	On-board Storage	Built-in microSD/microSDHC/microSDXC card slot, supporting minimum 256 GB	
	ONVIF/API	ONVIF Profile S/T/G or equivalent open interoperability standard	
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP, SMTP and other standard IP protocols	
	Day/Night Control	Day, Night, Auto and Schedule modes	
	Perimeter Protection	Minimum line crossing, intrusion, region entrance and region exiting detection	
	Target Classification	Human and vehicle classification for supported perimeter events	
	Event Linkage	Recording, image capture, FTP/NAS upload, email/central monitoring notification and other standard event actions	
	Flashing/Warning Light	White-light visual warning/flash functionality	
	Reset	Physical reset facility	
	Power Supply	12 VDC and IEEE 802.3af PoE or better	
	Power Consumption	Maximum 12 W under normal operating conditions	
	Housing	Durable metal or equivalent robust housing suitable for school/office environment	
	Operating Temperature	At least -30°C to +60°C	
	Operating Humidity	Up to 95% RH, non-condensing, or better	
	Protection Rating	Minimum IP67 and IK10, or better	
	Security	Password protection, user authentication and secure configuration	
	Management	Configuration and monitoring through web interface and compatible NVR/VMS	
	Warranty	Minimum 2 years from successful installation and acceptance	
27. Technical Specification of 8MP AI camera			
	Manufacturer, Country		

	Brand	
	Model	
	Camera Type	8MP AI-enabled IP Camera suitable for outdoor surveillance and critical monitoring areas
	Image Sensor	Minimum 1/1.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 3840 × 2160 (8MP/4K)
	Minimum Illumination	Color: ≤0.001 Lux @ F1.2, AGC ON, or better; 0 Lux with supplementary illumination
	Shutter Speed	Range covering at least 1 s to 1/100,000 s or better
	Day/Night	Automatic Day/Night operation with IR-cut filter and enhanced low-light performance
	Lens	Motorized/vari-focal lens covering approximately 2.8–12 mm, or equivalent
	Horizontal FOV	Approximately ≥47° at telephoto and ≥110° at wide angle, or equivalent optical performance
	Iris	P-Iris or equivalent automatic iris control
	Aperture	Suitable for low-light 24-hour surveillance; approximately F1.5 or better at wide angle
	Supplementary Illumination	Hybrid IR and white-light illumination with intelligent/smart illumination control
	IR Illumination Distance	Minimum 80 m, or equivalent effective night surveillance performance
	White-Light Distance	Minimum 60 m
	IR Wavelength	Approximately 850 nm
	Main Stream	Minimum 25 fps at 3840 × 2160 at 50 Hz and 30 fps at 3840 × 2160 at 60 Hz, or equivalent
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	Region of Interest	ROI functionality with multiple configurable regions
	AI Video Encoding	AI-assisted video encoding/compression supported, where available
	Audio	Built-in audio recording capability
	Microphone	Minimum 2 built-in microphones
	Audio Compression	Support for G.711 and/or AAC or equivalent
	Audio Sampling	Minimum 8 kHz, with higher sampling supported
	Noise Reduction	Environmental/background noise filtering
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP/SFTP, SMTP, SNMP and other standard IP protocols
	ONVIF/API	ONVIF Profile S/T/G or equivalent open interoperability standard

	Network Storage	Support for NAS storage using standard protocols such as NFS/SMB/CIFS or equivalent
	ANR	Automatic Network Replenishment (ANR) or equivalent edge-storage recovery functionality
	Image Settings	Brightness, contrast, saturation, sharpness, gain, white balance, image rotation and other standard image controls
	Day/Night Control	Day, Night, Auto, Schedule and alarm-triggered modes
	WDR	Minimum 130 dB WDR
	Image Enhancement	BLC, HLC, 3D DNR, defog and distortion correction or equivalent
	Image Stabilization	Electronic Image Stabilization (EIS) or equivalent
	SNR	≥52 dB, or equivalent low-noise performance
	Ethernet Interface	Minimum 1 × RJ45 10/100 Mbps adaptive Ethernet port
	On-board Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB
	Alarm Interface	Minimum 1 alarm input and 1 alarm output
	Audio Interface	Line-in and line-out audio interfaces, where applicable
	Built-in Speaker	Built-in speaker supporting audio communication/warning functionality
	RS-485	RS-485 interface for compatible control/accessory devices
	Reset	Physical reset facility
	Face Detection/Capture	AI-based face detection/capture capability; simultaneous detection of multiple faces
	Face Analysis	Support for face detection and basic face-related metadata/analysis
	Perimeter Protection	Minimum line crossing, intrusion, region entrance and region exiting detection
	Target Classification	Human and vehicle classification for supported AI/perimeter events
	Advanced AI	Support for AI-based object/person/vehicle detection and search through compatible NVR/VMS
	Metadata	Metadata generation for supported intelligent detection events
	Smart Search	Ability to search/filter recorded events by supported object categories such as human and vehicle, through compatible NVR/VMS
	Power Supply	12 VDC and IEEE 802.3at PoE+ or better
	Power Output	12 VDC auxiliary output where required for compatible accessories

pcs

	Operating Temperature	At least -30°C to +60°C
	Operating Humidity	Up to 95% RH, non-condensing, or better
	Heater	Built-in heater or equivalent cold-weather protection where required
	Demist	Built-in lens demisting/defogging facility or equivalent
	Housing	Robust metal housing suitable for outdoor and critical surveillance applications
	Protection Rating	Minimum IP67 and IK10, or better
	Security	Password protection, secure authentication, encrypted communication and secure log management
	General Functions	Heartbeat, anti-banding, mirror, one-key reset and system/event logging
	Compliance	Relevant applicable safety, EMC and environmental compliance certifications
	Warranty	Minimum 2 years from successful installation and acceptance

28. Technical Specification of 8MP dome teacher monitoring camera

	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	8MP Smart IP Dome Camera suitable for classroom/teacher monitoring, lecture recording and intelligent video analysis
	Image Sensor	Minimum 1/1.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 3840 × 2160 (8MP/4K)
	Minimum Illumination	Color: ≤0.002 Lux @ F1.2, AGC ON, or better; B/W: ≤0.0005 Lux @ F1.2, or better; 0 Lux with IR illumination
	Shutter Speed	Range covering at least 1 s to 1/100,000 s or better
	Day/Night	Automatic Day/Night operation with IR-cut filter
	Camera Adjustment	Pan approximately 0–355°, Tilt approximately 0–75°, Rotation approximately 0–355°
	Focus	Auto, semi-auto and manual focus
	Lens	Motorized/vari-focal lens approximately 2.8–12 mm or 8–32 mm, or equivalent
	Iris	P-Iris or equivalent automatic iris control
	Aperture	Approximately F1.2 or better at wide-angle setting, or equivalent low-light performance
	Supplementary Illumination	IR illumination with intelligent/smart illumination control

	IR Illumination Range	Minimum 40 m for standard focal range or equivalent effective monitoring distance
	IR Wavelength	Approximately 850 nm
	Main Stream	Minimum 25 fps at 3840 × 2160 at 50 Hz and 30 fps at 3840 × 2160 at 60 Hz, or equivalent
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	ROI	Region of Interest functionality supported
	Target Cropping	Intelligent target/object cropping or equivalent digital target-detailing functionality
	Audio	Audio recording capability with environmental noise filtering
	Audio Compression	Support for G.711 and/or AAC or equivalent
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP/SFTP, SMTP, SNMP and other standard IP protocols
	ONVIF/API	ONVIF Profile S/T/G or equivalent open interoperability standard
	Network Storage	Support for NAS storage using NFS/SMB/CIFS or equivalent
	ANR	Automatic Network Replenishment (ANR) or equivalent edge-storage recovery function
	Storage Security	Support for secure/encrypted local storage and storage health monitoring
	Browser/Management	Configuration and live viewing through modern standard web browsers and/or compatible VMS/NVR
	Image Parameters	Brightness, contrast, saturation, sharpness, gain, white balance, rotation and other standard image controls
	Day/Night Control	Day, Night, Auto, Schedule and alarm-triggered modes
	WDR	Minimum 120 dB WDR
	Image Enhancement	BLC, HLC, 3D DNR, Defog and EIS or equivalent
	Video Output	Optional analogue video output for maintenance/diagnostic purposes
	Ethernet Interface	Minimum 1 × RJ45 10/100/1000 Mbps adaptive Ethernet port
	On-board Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB
	Microphone	Minimum 2 built-in microphones
	Speaker	Built-in speaker suitable for audio communication/voice warning
	Alarm Interface	Minimum 2 alarm inputs and 2 alarm outputs, or equivalent alarm interface capability
	RS-485	RS-485 interface for compatible external control/accessory devices

pcs

	Reset	Physical reset facility
	Auxiliary Power Output	12 VDC auxiliary output where required for compatible accessories
	Smart Events	Minimum scene-change detection, audio exception detection and defocus detection
	Classroom/Teacher Analytics	AI-based classroom monitoring supporting configurable areas such as teacher/podium area, screen/blackboard area and other defined classroom zones
	Teacher Monitoring	Intelligent teacher/person tracking or close-up monitoring within a defined classroom/podium area
	Tracking Modes	Support for automatic/intelligent tracking or equivalent teacher-following functionality
	Intelligent Analysis	AI-based detection and analysis of persons/objects within configured areas
	Power Supply	12 VDC and IEEE 802.3at PoE+ or better
	Power Consumption	Maximum 15 W under normal operating conditions
	Operating Temperature	At least -30°C to +60°C
	Operating Humidity	Up to 95% RH, non-condensing, or better
	Housing	Robust dome housing suitable for classroom/institutional environments
	Protection Rating	Minimum IP67 and IK10, or better
	Security	Password protection, secure authentication, encrypted communication and secure system/log management
	Compliance	Relevant applicable safety, EMC and environmental compliance certifications
	Warranty	Minimum 2 years

29. Technical Specification of 8MP dome teacher monitoring camera

	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	Specialized 8MP/4K IP Camera for Classroom Student Monitoring and Intelligent Tracking
	Image Sensor	Progressive Scan CMOS, minimum 1/1.8-inch or better
	Maximum Resolution	Minimum 3840 × 2160 (8MP/4K)
	Minimum Illumination	Color: ≤0.002 Lux @ F1.2, AGC ON or better; B/W: ≤0.0005 Lux; 0 Lux with IR illumination
	Shutter Speed	At least 1 s to 1/100,000 s or wider
	Day/Night	Automatic Day/Night operation with IR-cut filter
	Camera Adjustment	Pan/tilt/rotation adjustment suitable for classroom installation

	Lens Type	Motorized varifocal lens, approximately 2.8–12 mm or equivalent
	Long-Focal-Length Option	Approximately 8–32 mm or equivalent may be provided where required
	Focus	Automatic, semi-automatic and/or manual focus
	Iris	P-iris or equivalent automatic iris control
	Aperture	Approximately F1.2 or better at the wide-angle end
	Supplementary Illumination	Integrated IR illumination with intelligent/automatic control
	IR Range	Minimum 40 meters for standard lens configuration or better
	Long-Lens IR Range	Minimum 60 meters for long-focal-length configuration, where provided
	IR Wavelength	Approximately 850 nm or equivalent
	Frame Rate	Minimum 25 fps at 3840×2160 at 50 Hz; equivalent 4K frame rate at 60 Hz
	Target/Object Cropping	Supported for selected person/object monitoring or equivalent intelligent cropping
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	Bit Rate Control	CBR and VBR
	Audio	Built-in microphone(s) for classroom audio monitoring
	Two-Way Audio	Supported through built-in speaker and/or external audio interface
	Audio Compression	G.711, AAC or equivalent standard audio codec
	Noise Filtering	Environmental/background noise reduction supported
	Built-in Speaker	Integrated speaker suitable for two-way communication and/or audible event notification
	Network Protocols	Standard IP protocols including IPv4/IPv6, TCP/IP, UDP, HTTP/HTTPS, DHCP, DNS, RTP/RTSP, NTP, SMTP, SNMP and equivalent
	Interoperability	ONVIF Profile S/G/T or equivalent open interoperability standard
	Network Storage	NAS support through NFS, SMB/CIFS or equivalent
	Edge Storage Recovery	ANR or equivalent automatic recording recovery after network interruption
	Local Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB
	Storage Security	Secure/encrypted local storage and storage health monitoring supported or equivalent

	Web/VMS Management	Configuration, monitoring and playback through modern web browsers and/or compatible VMS/NVR software
	Image Settings	Brightness, contrast, saturation, sharpness, gain, white balance and other standard image adjustments
	Day/Night Modes	Day, Night, Auto, Schedule and/or alarm-triggered switching
	WDR	Minimum 120 dB WDR or equivalent
	Image Enhancement	BLC, HLC, 3D DNR, Defog and EIS or equivalent
	Video Output	Optional local service/debugging output may be provided; not mandatory where not required
	Ethernet Interface	Minimum 1 × RJ45 10/100/1000 Mbps Ethernet port
	Privacy Mask	Programmable privacy masking supported
	Alarm Interface	Minimum 2 alarm inputs and 2 alarm outputs, or equivalent
	RS-485	Optional where integration with external equipment is required
	Reset	Hardware/software reset function
	Smart Events	Scene change, audio exception, defocus detection and other relevant camera-health/event detection
	Classroom Area Configuration	Camera shall support configurable classroom areas/zones, including podium/teaching area, screen/blackboard area and other designated classroom regions
	Teacher Tracking	Shall support automatic teacher/person tracking within a defined classroom/teaching area
	Teacher Close-up Tracking	Shall provide automatic close-up tracking of the teacher/presenter or equivalent intelligent person-tracking functionality
	Tracking Modes	Support real-time and/or dynamic tracking modes, or equivalent intelligent tracking functionality
	Classroom Analytics	Support intelligent detection/analysis of persons and activities within configurable classroom areas
	Detection Zones	Multiple configurable polygonal or rectangular detection zones shall be supported
	Face Detection/Capture	Face detection and/or face capture supported
	Event Linkage	Event-triggered recording, image capture, notification, alarm output and upload to configured storage
	Power Supply	12 VDC and/or IEEE 802.3at PoE+

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	PoE	IEEE 802.3at Type 2 or better
	Power Consumption	Maximum 15 W under normal operating conditions
	Auxiliary Power Output	Optional; may be provided where required for approved accessories
	Housing	Robust metal or equivalent durable housing
	Operating Temperature	At least -30°C to +60°C or wider
	Operating Humidity	Up to 95% RH, non-condensing or better
	Protection	Minimum IP67 ingress protection; IK10 or equivalent impact protection preferred where camera is exposed to physical impact
	Security	Strong password policy, user authentication, HTTPS/TLS encryption, access control, IP filtering and security/audit logging
	General Functions	Heartbeat/camera-health monitoring, mirror/flip, watermark or equivalent security features
	Compliance	Applicable national/international safety, EMC and environmental compliance certifications
	Warranty	Minimum 2 years comprehensive warranty
	Accessories	Suitable mounting bracket, junction box/adaptor, power accessories and all required installation accessories shall be included

30. Technical Specification of 8MP varifocal motorized camera

	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	8MP Outdoor IP Camera with Motorized Varifocal Lens and Intelligent Video Analytics
	Image Sensor	Minimum 1/1.8" Progressive Scan CMOS or better
	Maximum Resolution	Minimum 3840 × 2160 (8MP/4K)
	Minimum Illumination	Color: ≤0.005 Lux @ F1.6, AGC ON, or better; B/W: 0 Lux with IR illumination
	Shutter Speed	Range covering at least 1/3 s to 1/100,000 s or better
	Day/Night	Automatic Day/Night operation with IR-cut filter
	Camera Adjustment	Pan approximately 0–355°, Tilt approximately 0–90°, Rotation approximately 0–360°
	Lens Type	Motorized varifocal lens, approximately 2.7–13.5 mm or equivalent
	Long-Range Lens	A longer focal-length option, approximately 7–35 mm, may be provided where required

	Iris	Auto-iris or equivalent automatic aperture control
	Focus	Auto, semi-auto and manual focus
	Aperture	Approximately F1.6 or better
	Supplementary Illumination	IR illumination with intelligent/smart illumination control
	IR Illumination Range	Minimum 60 m for standard varifocal range; higher range preferred for long-range lens
	IR Wavelength	Approximately 850 nm
	Main Stream	Minimum 25 fps at 3840 × 2160 at 50 Hz; equivalent 4K frame rate at 60 Hz
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent
	ROI	Region of Interest functionality with multiple configurable regions
	Target Cropping	Target/object cropping or equivalent digital detail enhancement
	Audio	Audio recording capability with environmental noise filtering
	Audio Compression	Support for G.711 and/or AAC or equivalent
	Network Protocols	IPv4/IPv6, TCP/IP, DHCP, DNS, HTTP/HTTPS, RTP/RTSP, NTP, FTP/SFTP, SMTP, SNMP, QoS and other standard IP protocols
	ONVIF/API	ONVIF Profile S/T/G or equivalent open interoperability standard
	Network Storage	Support for NAS using NFS/SMB/CIFS or equivalent
	ANR	Automatic Network Replenishment (ANR) or equivalent edge-storage recovery functionality
	Storage Security	Support for secure/encrypted memory-card storage and storage health monitoring
	Image Settings	Brightness, contrast, saturation, sharpness, gain, white balance, rotation and other standard image adjustments
	Day/Night Control	Day, Night, Auto and Schedule modes
	WDR	Minimum 120 dB WDR
	Image Enhancement	BLC, HLC, 3D DNR and Defog or equivalent
	SNR	≥52 dB, or equivalent low-noise performance
	Ethernet Interface	Minimum 1 × RJ45 10/100 Mbps adaptive Ethernet port
	On-board Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB
	Alarm Interface	Minimum 2 alarm inputs and 2 alarm outputs, or better
	Auxiliary Power Output	12 VDC auxiliary output where required for compatible accessories

pcs

	Smart Events	Scene change, audio exception, defocus and other intelligent event detection
	Advanced Object Detection	Support for unattended object/baggage detection and object removal detection, or equivalent
	Event Linkage	Recording, image capture, FTP/NAS/memory-card upload, email/central monitoring notification and alarm output
	Face Capture	AI-based face detection/capture capability
	People Counting	People-counting functionality
	Perimeter Protection	Minimum line crossing, intrusion, region entrance and region exiting detection
	Target Classification	Human and vehicle classification for supported perimeter events
	AI Analytics	Intelligent video analytics for person, vehicle and other supported objects
	Power Supply	12 VDC and IEEE 802.3at PoE+ or better
	Power Consumption	Maximum 15 W under normal operating conditions
	Power Protection	Reverse-polarity and other standard power protection features
	Operating Temperature	At least -30°C to +60°C
	Operating Humidity	Up to 95% RH, non-condensing, or better
	Housing	Robust metal housing suitable for outdoor/critical surveillance
	Protection Rating	Minimum IP67 and IK10, or better
	Security	Password protection, secure authentication, encrypted communication and secure event/log management
	General Functions	Heartbeat, anti-banding, mirror, system/event logging, password recovery and pixel-counting or equivalent
	Management	Configuration and monitoring through web interface and compatible NVR/VMS
	Compliance	Relevant applicable safety, EMC and environmental compliance certifications
	Warranty	Minimum 2 years from successful installation and acceptance
31. Technical Specification of 8MP fixed bullet camera		
	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	Outdoor/Indoor 8MP Fixed Bullet Network/IP Camera with intelligent video analytics
	Image Sensor	Progressive Scan CMOS, minimum 1/2.8-inch or better
	Maximum Resolution	Minimum 3840 × 2160 (8MP/4K)

	Minimum Illumination	Color: ≤ 0.005 Lux @ F1.6, AGC ON or better; 0 Lux with IR/white-light illumination
	Shutter Speed	At least 1/3 s to 1/100,000 s or wider range
	Day/Night	Automatic Day/Night operation with mechanical/electronic IR-cut filter
	Lens Type	Fixed focal lens; approximately 2.8 mm / 4 mm / 6 mm or equivalent focal lengths
	Field of View	Horizontal FOV of approximately $\geq 100^\circ$ with wide-angle lens option; equivalent coverage through other focal-length options is acceptable
	Lens Mount	Standard fixed-lens mount or equivalent
	Iris	Fixed or automatic iris appropriate to the lens design
	Aperture	F1.6 or better
	Supplementary Illumination	Integrated IR and/or white-light illumination with automatic/intelligent control
	IR/Light Range	Minimum 40 meters, subject to scene and environmental conditions
	IR Wavelength	Approximately 850 nm or equivalent
	Frame Rate	Minimum 20 fps at 3840×2160; preferably 25 fps or higher
	Video Compression	H.265/H.265+ and H.264/H.264+ or equivalent efficient video compression
	Bit Rate Control	CBR and VBR
	Region of Interest (ROI)	Multiple configurable ROI regions supported
	Target/Object Cropping	Supported or equivalent intelligent image/object cropping functionality
	Audio	Built-in microphone; audio recording and transmission supported
	Audio Compression	G.711 and/or AAC or equivalent standard audio codec
	Noise Reduction	Environmental/background noise filtering supported
	Network Protocols	Standard IP networking protocols including IPv4/IPv6, TCP/IP, UDP, HTTP/HTTPS, DHCP, DNS, RTP/RTSP, NTP, SMTP and SNMP or equivalent
	Interoperability	ONVIF Profile S/G/T or equivalent open interoperability standard
	Network Security	Strong password policy, HTTPS/TLS encryption, user authentication, IP filtering and security/event audit logging
	User Management	Multiple user accounts with role-based access control, including administrator/operator/user or equivalent
	Network Storage	Support for NAS/network storage using standard protocols such as NFS and/or SMB/CIFS

	Edge Storage Recovery	ANR or equivalent automatic recording recovery mechanism in case of network interruption	pcs
	Local Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB	
	Storage Security	Secure/encrypted local storage and storage health monitoring preferred	
	Web/Software Management	Configuration and live viewing through modern web browsers and/or compatible VMS/NVR software without dependence on obsolete browser technology	
	Image Adjustment	Image parameter adjustment, rotation and other basic image configuration functions	
	Day/Night Modes	Day, Night, Auto and Schedule modes or equivalent	
	WDR	Minimum 120 dB Wide Dynamic Range (WDR) or equivalent	
	Image Enhancement	BLC, HLC, 3D DNR or equivalent image enhancement technologies	
	Signal-to-Noise Ratio	≥52 dB or better	
	Privacy Mask	Minimum 4 programmable privacy masking areas	
	Ethernet Interface	Minimum 1 × RJ45 10/100 Mbps Ethernet port, auto-negotiating	
	Reset	Hardware/software reset function	
	Microphone	Built-in microphone, preferably dual/array microphone for improved audio pickup	
	Intelligent Video Analytics	Support for intelligent detection such as unattended object, object removal, loitering, people gathering, fast-moving object and/or parking detection, as applicable	
	Video Quality Diagnosis	Basic camera/video quality monitoring or equivalent diagnostic capability	
	Face Detection/Capture	Face detection and/or face capture capability	
	Perimeter Protection	Line crossing, intrusion detection, region entrance and region exit detection	
	Target Classification	Human and vehicle classification for applicable intelligent events	
	Event Linkage	Event-triggered recording, image capture, email/notification and upload to configured network/local storage	
	Power Supply	12 VDC and/or IEEE 802.3af PoE	
	Power Consumption	Maximum 12 W under normal operating conditions	
	Housing	Robust metal or equivalent weather-resistant housing	
	Operating Temperature	At least -30°C to +60°C or wider	
	Operating Humidity	Up to 95% RH, non-condensing or better	

	Ingress Protection	Minimum IP67	
	Mechanical Protection	Minimum IK10 impact protection or equivalent, where required for exposed installations	
	Compliance	Applicable national/international safety, EMC and environmental compliance certifications	
	Warranty	Minimum 2 years comprehensive warranty including hardware defects	
	Accessories	Necessary mounting bracket, junction box/adaptor, power accessories and other installation accessories shall be included as required for complete installation	
32. Technical Specification of 4 MP + 4 MP cameras			
	Manufacturer, Country		pcs
	Brand		
	Model		
	Product Type	4MP Fixed Lens + 4MP PT Network Camera	
	Image Sensor	Bullet channel: 1/2.8" Progressive Scan CMOS PT channel: 1/2.8" Progressive Scan CMOS	
	Minimum Illumination	Bullet & PT channels: Color: 0.005 Lux @ (F2.0, AGC ON), B/W: 0.005 Lux @ (F2.0, AGC ON), 0 Lux with IR	
	Shutter Speed	1 s to 1/30,000 s	
	Slow Shutter	Yes	
	Day & Night	ICR	
	Resolution	2560 × 1440 (Bullet & PTZ channels)	
	Lens — Focal Length	Bullet: 2.8 mm PT: 8 mm	
	Field of View (FOV)	Bullet channel: H: 94°, V: 49°, D: 114° PTZ channel: H: 44°, V: 24°, D: 51°	
	Aperture	F1.6 (Bullet & PT)	
	Illuminator	Hybrid (IR + White Light) for Bullet & PT	
	Supplement Light Range	Up to 30 m (Bullet & PT)	
	Smart Light	Yes	
	PT Movement – Pan	Panoramic: 0° to 355° PTZ: 0° to 345°	
	PT Movement – Tilt	Panoramic: 7° to 17° (manual adjust) PTZ: 0° to 80°	
	Pan Speed	4° – 25°/s (configurable), Preset: 25°/s	
	Tilt Speed	4° – 20°/s (configurable), Preset: 20°/s	
	Presets	200 presets	
	Compression	H.265/H.264	
	Video Streams	Main stream: up to 2560 × 1440 @ 25/30 fps (Bullet & PTZ)	
	Interface	1 × RJ45 10/100 Mbps Ethernet	
	Built-In Audio	1 microphone, 1 speaker	

	On-Board Storage	microSD / microSDHC / microSDXC up to 512 GB capacity
	Network Features	FTP/NAS upload, motion detection (human & vehicle)
	API	ONVIF(S,G,T), ISAPI etc
	Image	Digital WDR, BLC, HLC, DNR etc
	Power Supply	12 VDC $\pm 25\%$, 1.5 A / PoE (IEEE 802.3at, Class 4, max. 21.5 W)
	Operating Conditions	-30°C to 50°C (-22°F to 122°F), humidity $\leq 95\%$ non-condensing
	Material	Poly Carbonate
	Protection	IP66 (weather & dust resistant), surge & voltage transient protection
	Event & Alarm	Motion detection, upload to FTP/NAS/memory card, notify center, email trigger, audible warning
	Certifications	Standard: IP66, surge protection
	Warranty	min. 2 years sales and service
33. Technical Specification of 4 MP ANPR camera		
	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	Automatic Number Plate Recognition IP camera suitable for vehicle identification and traffic monitoring
	Image Sensor	Progressive Scan CMOS, minimum 1/1.8-inch or better
	Image Resolution	Minimum 2688×1520 or higher
	Lens	Motorized/adjustable varifocal lens suitable for ANPR applications; approximately 10–30 mm or equivalent
	Minimum Illumination	≤ 0.0005 Lux or better under specified operating conditions; suitable IR/white-light illumination for low-light operation
	Day/Night	Automatic Day/Night operation with IR-cut filter or equivalent
	Video Frame Rate	Minimum 25 fps at the specified ANPR operating resolution
	Vehicle Capture Speed	Suitable for vehicle speeds of at least 5–120 km/h or better
	Plate Capture/Recognition Performance	Minimum 98% recognition accuracy under manufacturer-specified and properly controlled installation/test conditions, or equivalent demonstrated performance
	Lane Coverage	Minimum 2 traffic lanes, subject to appropriate camera installation, lane width and traffic conditions
	Supplementary Illumination	Integrated IR and/or white/warm-light illumination suitable for ANPR operation

	Supplementary Light Range	Minimum 50 meters or better, subject to site conditions
	WDR	Minimum 120 dB WDR or equivalent; higher performance acceptable
	Local Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 256 GB
	Interoperability	ONVIF Profile S, G, T and/or M, or equivalent open interoperability standard appropriate for video, metadata and event integration
	Target Detection	Detection and classification of motor vehicles and non-motor vehicles
	License Plate Recognition	Automatic recognition and capture of vehicle license plates, including Nepalese/Nepali license plates, subject to supported plate formats and appropriate camera installation
	Plate Data	Shall support recording/searching of plate number, date/time, vehicle image and relevant metadata
	Vehicle Type Recognition	Intelligent vehicle classification including, as applicable, bus, SUV/MPV, pickup, heavy/medium truck, van, motorcycle, tricycle and other available vehicle categories
	Vehicle Color Recognition	Vehicle color classification including commonly identifiable colors such as white, black, red, yellow, gray, blue, green, brown and others supported by the system
	Traffic/Incident Detection	Support for applicable traffic events such as speeding, low-speed driving, lane change, stopped vehicle, wrong-way driving, traffic congestion and similar intelligent traffic events
	Whitelist/Blacklist	Support for configurable vehicle whitelist/blacklist management with capacity of minimum 10,000 records or better
	Search and Retrieval	Search/filter by license plate number, date/time, vehicle type, color and other available metadata
	Network Interface	Minimum 1 × 10/100/1000 Mbps Ethernet port or better
	Alarm Interface	Minimum 1 alarm input and 1 alarm output, or better
	Relay Interface	Relay output(s) for integration with gate/barrier, warning systems or other approved equipment, where required
	RS-485	Minimum 1 × RS-485 or equivalent interface where required for system integration

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	Network Protocols	Standard IP networking protocols including IPv4/IPv6, TCP/IP, HTTP/HTTPS, DHCP, DNS, RTP/RTSP, NTP, SMTP and equivalent
	Network Security	User authentication, strong password policy, HTTPS/TLS encryption, access control and security/event logging
	Power Supply	12–24 VDC and/or IEEE 802.3af/802.3at PoE, as applicable to the proposed camera
	Power Protection	Appropriate protection against reverse polarity, over-voltage and electrical fluctuation
	Housing	Rugged outdoor housing suitable for continuous operation
	Ingress Protection	Minimum IP67
	Mechanical Protection	Minimum IK10 or equivalent impact protection
	Operating Temperature	At least -30°C to +60°C or wider
	Operating Humidity	Up to 95% RH, non-condensing or better
	ANPR Software/Analytics	Required ANPR/LPR analytics shall be integrated into the camera or supplied as part of the proposed solution without additional mandatory proprietary hardware for basic ANPR functionality
	Event/Metadata Output	Recognized plate data and associated metadata shall be exportable/integrable with compatible VMS/NVR/traffic management systems
	Firmware/Software	Vendor shall provide required firmware/software updates during the warranty period
	Warranty	Minimum 2 years comprehensive warranty
	Installation Accessories	All necessary mounting brackets, junction boxes, power accessories, connectors and installation accessories required for complete installation shall be included
34. Technical Specification of 5 MP Traffic enforcement camera		
	Manufacturer, Country	
	Brand	
	Model	
	Camera Type	Intelligent 5MP or higher ITS/Traffic Enforcement IP Camera suitable for ANPR/LPR, vehicle detection, traffic monitoring and violation detection
	Image Sensor	Progressive Scan CMOS/GS-CMOS or equivalent, minimum 2/3-inch or better
	Resolution	Minimum 5MP; proposed camera shall provide sufficient resolution for ANPR and traffic enforcement applications

	Lens	Motorized/adjustable varifocal lens suitable for ITS/ANPR applications; approximately 11–40 mm or equivalent
	Lane Coverage	Minimum 2 traffic lanes under appropriate installation conditions
	Minimum Illumination	≤0.001 Lux or better under specified operating conditions, with suitable illumination for nighttime operation
	Frame Rate	Minimum 50 fps at the specified ITS/ANPR operating resolution, or equivalent performance suitable for high-speed vehicle capture
	Vehicle Capture Speed	Suitable for vehicle speeds of at least 10–300 km/h, or equivalent high-speed vehicle capture capability
	Recognition Accuracy	Minimum 98% recognition accuracy under manufacturer-specified and properly controlled installation/test conditions
	Trigger Modes	Support for video-based, radar-based and external I/O triggering, or equivalent trigger/integration mechanisms
	Local Storage	Built-in microSD/microSDHC/microSDXC card slot supporting minimum 512 GB
	Interoperability	ONVIF Profile S/G/T/M or equivalent open interoperability standard, as applicable to the proposed functions
	Target Detection	Detection and classification of motor vehicles and non-motor vehicles
	License Plate Recognition	Automatic vehicle license plate detection, capture and recognition, including applicable Nepalese/Nepali license plate formats
	Vehicle Type Recognition	Intelligent vehicle classification including, as applicable, bus, SUV/MPV, pickup, heavy/medium truck, van, motorcycle and other supported vehicle categories
	Vehicle Color Recognition	Vehicle color classification including commonly identifiable colors such as white, black, red, yellow, gray, blue, green, brown and other supported colors
	Traffic Violation Detection	Support for applicable traffic violation/event detection, including wrong-way driving, emergency-lane occupancy, lane violation, lane change and other configurable traffic events
	Driver/Occupant Violation Detection	Where supported by the proposed solution, detection of seatbelt non-compliance, mobile-phone use while driving and similar driver-behavior violations

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	Traffic Event Snapshot	Automatic capture of violation/event images with associated date, time, location/camera ID, license plate and available vehicle metadata
	Network Interfaces	Minimum 2 × 10/100/1000 Mbps Ethernet ports or better; additional network interfaces acceptable
	Serial/Integration Interfaces	Interfaces suitable for integration with external ITS equipment, such as RS-485/RS-232 or equivalent, as required
	USB Interface	Minimum 1 USB port or equivalent service/integration interface
	Alarm/Trigger I/O	Suitable digital input/output interfaces for external trigger, alarm or traffic-system integration
	Power Supply	100–240 VAC, 50/60 Hz or equivalent power arrangement suitable for continuous outdoor ITS installation
	Power Protection	Suitable protection against electrical fluctuation, surge and other normal field power conditions
	Network Protocols	Standard IP protocols including IPv4/IPv6, TCP/IP, UDP, HTTP/HTTPS, RTP/RTSP, NTP, DHCP, DNS and equivalent
	Network Security	Strong password policy, user authentication, HTTPS/TLS encryption, access control and security/audit logging
	ANPR Metadata	Recognized plate number and associated vehicle/event metadata shall be available for search, storage and integration with compatible VMS/ITS systems
	Event Search	Search/filter by license plate, date/time, vehicle type, vehicle color, violation type and other available metadata
	Traffic Data Integration	Camera shall support integration with compatible traffic management, ANPR, VMS/NVR or central monitoring systems through standard interfaces/API where required
	Environmental Protection	Minimum IP67 ingress protection
	Mechanical Protection	Minimum IK10 impact protection or equivalent
	Firmware/Software	Required firmware/software for the specified functionality shall be supplied and supported during the warranty period
	Warranty	Minimum 2 years comprehensive warranty

	Accessories	All necessary mounting hardware, junction box, connectors, power accessories and other accessories required for complete installation shall be included	
35. Technical Specification of supplement light			
	Manufacturer, Country		pcs
	Brand		
	Model		
	General requirements	Should have built-in automatic light control Should support ambient brightness detection Should automatically start-up at low illumination	
	Illuminance coverage	Min. 2 lanes	
	LEDs	≥ 16	
	Illuminator Type	White Light	
	Light Source	Visible Light	
	Illumination range	≥ 25m	
	Color Temperature	3000 K ± 10% (warm light for less eye strain and avoid glare)	
	Day/Night Function	Should support ambient brightness detection and automatically start-up at low illumination	
	Protection	Min. IP66	
	Power Supply	100V-240 VAC	
	Power Consumption	≤ 35W	
	Operating Conditions	Temperature: -40 °C to 70 °C or better	
	Compatibility	Must be fully compatible with ANPR Camera	
	Accessories	Proper mounting bracket and all other necessary accessories must be included.	
	Documents	Product datasheet, ISO Certificate, Manufacturer Authorization Certificate, Warranty Letter, and Compliance Sheet must be submitted along with the bid.	
	Certification	CE, CB, LVD	
	Warranty	Minimum 1 year	
36. Technical Specification of server for Traffic enforcement camera			
	Manufacturer, Country		
	Brand		
	Model		
1	Device Type	Dedicated/industrial-grade Edge Computing Server suitable for ITS/ANPR camera data processing, video management, analytics, metadata processing and local data storage.	
2	Video Compression	Shall support H.264 and H.265 video compression/decoding, or equivalent current industry-standard codecs.	

3	Video Input / Camera Connectivity	Shall support connection of minimum 8 IP/ITS camera streams, with provision for at least 4 cameras through direct/local interfaces or equivalent dedicated connectivity, where applicable. The system shall support network-based camera integration.
4	Video/Network Protocols	Shall support commonly used IP networking and video-streaming protocols required for ITS applications, including TCP/IP, UDP, IPv4/IPv6, DHCP, DNS, NTP, HTTP/HTTPS, RTP/RTSP and equivalent industry-standard protocols as applicable.
5	Interoperability / API	Shall support ONVIF or equivalent open interoperability standard and provide documented API/SDK or equivalent interface for integration with third-party ITS, ANPR, VMS and monitoring software.
6	Cybersecurity	Shall provide user authentication, role-based access control, secure password policy, HTTPS/TLS encryption, secure remote access, session timeout and protection against unauthorized access. Current secure TLS versions shall be supported.
7	User Management	Shall support minimum 10 concurrent/registered user accounts with configurable role-based permissions, including administrator/operator or equivalent access levels.
8	Network Interfaces	Shall provide sufficient network interfaces for camera, management and data communication, including minimum $2 \times 10/100/1000$ Mbps Ethernet ports. Additional Ethernet/fiber interfaces may be provided where required by the proposed architecture.
9	Audio Input/Output	Minimum 1 audio input and 1 audio output, where audio is required by the ITS application.
10	Alarm Input/Output	Minimum 2 alarm inputs and 2 alarm outputs, or equivalent digital I/O for integration with external ITS devices.
11	Serial Interfaces	Shall provide minimum $1 \times$ RS-232 and $1 \times$ RS-485 interface, or equivalent standard interface required for integration with compatible ITS/radar/peripheral equipment.
12	USB Interface	Minimum $1 \times$ USB interface for system administration, maintenance or approved peripheral connectivity.

13	Data Processing / Uploading	Shall support real-time and manual data transfer/uploading of ANPR/ITS metadata, event records, snapshots and related information to a central server or designated platform.
14	Local Processing	Shall be capable of local/edge processing of connected camera streams and ITS/ANPR metadata without requiring continuous dependence on a remote/cloud server for basic local operation.
15	Operating System	Linux-based or equivalent secure operating system suitable for 24×7 industrial/ITS operation, with Web-based management interface.
16	Storage	Shall support minimum 8 TB usable local storage capacity, using enterprise/surveillance-grade HDD/SSD or equivalent suitable for continuous ITS data recording and storage. Storage shall be expandable where applicable.
17	Storage Management	Shall support event/metadata storage, scheduled or continuous recording as applicable, data search/retrieval and export/backup facilities.
18	Power Supply	Suitable for continuous 24×7 operation. Power input may be DC or AC with suitable external/internal power supply. The proposed system shall include appropriate power protection and adapter/PSU as required.
19	Power Consumption	The proposed system shall be energy efficient and suitable for the offered hardware configuration. Power consumption shall be declared by the bidder.
20	Operating Temperature	Minimum operating temperature range of approximately -30°C to +55°C, or wider.
21	Operating Humidity	Minimum 5% to 95% relative humidity, non-condensing, or better.
22	Reliability	Suitable for 24×7 continuous operation in an ITS/traffic monitoring environment.
23	Remote Management	Web-based system management, health/status monitoring, configuration, user management and system/event log access shall be supported.
24	Data Security	Stored and transmitted data shall have appropriate security mechanisms, including authenticated access and encrypted communication where supported.

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25	Integration	Shall support integration with ANPR/LPR cameras, ITS cameras, radar/traffic sensors and central monitoring/VMS/ITS platforms through standard network protocols, ONVIF, API, SDK or equivalent open interfaces.	
26	System Logs	Shall maintain system, user, security and event logs with facilities for viewing and exporting logs.	
27	Firmware / Software Update	Secure firmware/software upgrade mechanism shall be provided.	
28	Certifications / Compliance	Product shall comply with applicable international safety, electromagnetic compatibility and environmental requirements. Relevant certificates such as CE, RoHS, CB or equivalent, where applicable, shall be submitted.	
31	Warranty	Minimum 2 years comprehensive warranty covering hardware and supplied system software/firmware support.	
32	Accessories	All necessary power supply, cables, mounting accessories, storage components and other accessories required for complete and operational installation shall be included.	
37. Technical Specification of 64 channel NVR			
	Manufacturer, Country A1308:C1331B1308:C1330		pcs
	Brand		
	Model		
	Camera Input	min. 64 channels	
	Supported Resolution	upto 28 MP or higher	
	Video compression	H.265+, H.265, H.264+, H.264	
	Incoming bandwidth	Min. 380 Mbps or higher	
	Outgoing bandwidth	Min. 380 Mbps or higher	
	Simultaneous Playback	min. 16 channels	
	Recording	Continuous, scheduled, motion/event and alarm-based recording	
	AI function	Face detection/recognition, perimeter protection, human classification, intelligent search	
	Support features	support License plate recognition through compatible	
	Storage	Min. 6 SATA interface each supporting min. 10TB	
	RAID	Yes	
	Network storage	Yes	
	Output	Minimum 2×HDMI supporting 4K display resolution or higher	
	Interface	minimum 2×RJ-45 Gigabit Ethernet, 2×USB interface including USB 3.0	

	Protocol	ONVIF Profile S/G/T or equivalent	
	Playback search	Date/time search, event search, motion search, smart/AI search	
	Remote access	web browser, client software, mobile application, remote live view/playback	
	User management	Multi-user access with role-based permissions	
	Service & Support	Supplier shall provide installation, configuration, testing and basic operational training where required	
	Accessories	Required accessories for installation	
	Warranty	minimum 1 year	
38. Technical Specification of 32 ch AI NVR			
	Manufacturer, Country		pcs
	Brand		
	Model		
	IP Video Input	32-ch or better	
	Incoming / Outgoing Bandwidth	384 Mbps / 256 Mbps or better	
	HDMI and VGA Output	upto 4K and 1080p or better	
	Video Decoding Format	H.265+, H.265, H.264+, H.264 or better	
	Recording Resolution	upto 32MP or better	
	Decoding Capability	upto 32-ch @ 1080p(30fps) or better	
	Network Protocol	IPv4, IPv6, TCP/IP, DHCP, NTP, UPnP, DNS, DDNS, HTTPS, SMTP, NFS, iSCSI	
	Ethernet Interface	2 Port 10M/100M/1000M RJ-45 Interface or better Speed Ethernet Port.	
	Storage Capacity	4 SATA interface with 20TB per HDD or better	
	USB Interface	1 × USB 2.0, 1 x USB 3.0 or more	
	Alarm in/out	16/9 or better	
	Power Consumption	≤ 50 W or lower	
	Working Temperature	-10 to +55° C or better	
	Smart/AI Features	Should support Face recognition, People counting, ANPR, function to input target description and obtain the corresponding targets that matches the description of targets and more functions	
	Service & Support	Supplier shall provide installation, configuration, testing and basic operational training where required	
	Accessories	Required accessories for installation	
	Warranty	Minimum 2 Years	
39. Technical Specification of 16 ch NVR			
	Manufacturer, Country		
	Brand		
	Model		

	Device Type	Network Video Recorder (NVR) suitable for 24×7 IP video surveillance, recording, playback, intelligent video analytics and integration with IP cameras.
	IP Video Input	Minimum 16 IP camera channels.
	Incoming Bandwidth	Minimum 160 Mbps or higher
	Outgoing Bandwidth	Minimum 200 Mbps or higher for live view, playback and remote access.
	Camera Compatibility	Shall support cameras from the proposed manufacturer and compatible third-party IP cameras through ONVIF and/or equivalent open standards.
	Video Compression	H.265/H.265+, H.264/H.264+ or equivalent industry-standard compression.
	Recording Resolution	Shall support recording of cameras up to minimum 32MP or equivalent high-resolution IP camera input, including 8MP/4K and lower resolutions.
	Recording	Continuous, scheduled, event/alarm-based and motion-based recording shall be supported.
	Dual Stream	Shall support main stream and sub-stream/dual-stream recording or equivalent bandwidth-efficient recording mechanism.
	Synchronous Playback	Minimum 16-channel synchronous playback or equivalent simultaneous playback capability.
	AI Analytics – NVR Based	Shall support intelligent analytics such as face detection/recognition, perimeter protection and advanced motion detection, either natively or through compatible connected cameras.
	AI Analytics – Camera Based	Shall support camera-side intelligent functions including, as applicable, face recognition/detection, perimeter protection, video/target classification, people counting and ANPR/LPR.
	Face Capture / Analytics	Shall support face capture/analysis from connected IP cameras. Actual supported channels shall be declared by bidder and shall be adequate for the proposed system architecture.
	Motion Detection	Motion detection shall be available on all IP channels either through NVR-based analytics or supported camera-based analytics.

	Perimeter Protection	Shall support configurable line-crossing, intrusion/region-entry/exit or equivalent perimeter protection functions, with human/vehicle classification where supported.	pcs
	People Counting / Heat Map	Shall support people-counting and heat-map data management where provided by compatible cameras.	
	Output port	Minimum 1 × HDMI output supporting 4K (3840×2160) at approximately 30 Hz or better, minimum 1×VGA	
	Audio Output	Minimum 1 audio output.	
	Two-Way Audio	Two-way audio communication shall be supported through compatible cameras or audio devices.	
	Audio Compression	Shall support commonly used audio codecs such as G.711, G.726, AAC or equivalent.	
	Network Interface	Minimum 2 × 10/100/1000 Mbps RJ-45 Ethernet ports or equivalent network connectivity suitable for camera and management/data networks.	
	Network Protocols	Shall support standard networking and video protocols required for operation, including TCP/IP, UDP, IPv4/IPv6, DHCP, DNS, NTP, HTTP/HTTPS, RTSP, SMTP, SNMP and other relevant industry-standard protocols.	
	Interoperability	Shall support ONVIF Profile S/G/T or equivalent applicable open interoperability standards for integration with compatible IP cameras and third-party systems.	
	Camera Access	Shall support standard IP camera communication through ONVIF, RTSP or equivalent open protocols.	
	Remote Access	Secure remote monitoring, playback, configuration and management through authorized users shall be supported.	
	API / Integration	Shall provide documented API/SDK or equivalent integration interface for integration with VMS, security management, ANPR/ITS and other third-party systems, where required.	
	Storage Interface	Minimum 2 × SATA interfaces each supporting minimum 10 TB HDD capacity	
	HDD Management	Support for surveillance/enterprise-grade HDDs suitable for continuous 24×7 recording. HDD health/status monitoring shall be supported.	
	Alarm Input/Output	Minimum 4 alarm inputs and 1 alarm output, or equivalent digital alarm I/O.	

	USB	Minimum 2 USB ports, including at least one USB 3.0 or better, for backup, mouse, configuration or maintenance.
	Backup	Recorded video, snapshots and relevant metadata shall be exportable to USB, network storage or other supported backup media.
	User Management	Role-based user management with configurable permissions and secure authentication.
	Secure Communication	Secure encrypted communication shall be supported using current industry-standard encryption/TLS mechanisms.
	Secure Boot / System Integrity	Secure boot, firmware integrity verification or equivalent system-integrity protection is preferred.
	Network Authentication	IEEE 802.1X or equivalent network access-control mechanism is preferred where applicable.
	IP/MAC Filtering	IP/network access filtering and/or equivalent access-control functionality shall be supported.
	Web Management	Web-based configuration and management through current supported browsers. Exact browser version shall not be restricted in the tender.
	Firmware Update	Secure firmware/software upgrade mechanism shall be provided.
	Compliance / Certification	Shall comply with applicable product safety, EMC and environmental requirements. Relevant certificates such as CE, RoHS, CB or equivalent may be submitted where applicable.
	Accessories	All necessary power supply, cables, rack/mounting accessories, HDD mounting hardware and other accessories required for complete operation shall be included.
	Warranty	Minimum 2 years comprehensive warranty.
40. Technical Specification of 8 ch NVR		
	Manufacturer, Country	
	Brand	
	Model No	
	Device Type	Network Video Recorder (NVR)
	IP Camera Input Channels	Up to 8 channels or more
	Supported Recording Resolution	Up to 8 MP
	Video Compression	H.265+, H.265, H.264+, H.264
	Incoming Bandwidth	min. 80 Mbps or better
	Outgoing Bandwidth	min. 80 Mbps or better

pcs

	Playback	8-channel synchronous	
	Video Output	HDMI (4K) + VGA	
	Storage (HDD)	min. 2 × SATA each supporting min. 16 TB	
	Protocols	ONVIF, SDK, ISAPI	
	Network Interface	1, RJ-45 10/100 Mbps self-adaptive Ethernet interface	
	Two way audio	supported	
	Power	12V DC, 1.5A	
	Warranty	2 years service and parts	
41. Technical Specification of 16 TB HDD			
	Manufacture, Country		pcs
	Brand Name		
	Model No.		
	Form Factor	3.5-Inch, Surveillance grade	
	Interface	SATA 6 Gbit/s	
	Formatted Capacity	16TB / 16,000GB	
	Performance	Interface Speed 6.0 Gbit/s Rotation Speed 7,200 RPM Buffer Size 256 MiB Maximum Data Transfer Speed (Sustained) 240 MB/s	
	Warranty	1 year	
42. Technical Specification of 10 TB HDD			
	Manufacture, Country		pcs
	Brand Name		
	Model No.		
	Tor Size	512E	
	Form Factor	3.5-Inch, Surveillance grade	
	Interface	SATA 6 Gbit/s	
	Formatted Capacity	10TB / 10,000GB	
	Performance	Interface Speed 6.0 Gbit/s Rotation Speed 7,200 RPM Buffer Size 256 MiB Maximum Data Transfer Speed (Sustained) 237 MiB/s	
	Warranty	1 year	
43. Technical Specification of 8 TB HDD			
	Manufacture, Country		pcs
	Brand Name		
	Model No.		
	Capacities	8 TB	
	Interface	SATA 6Gb/s	
	FEATURES AND PERFORMANCE		
	Max Sustained Transfer Rate OD (MB/s)	> 200MB/s	
	Hard Disk Rotational Speed	More than or equal 5400 RPM	
	Cache	128 MB or higher	
	Load/Unload Cycles	300,000	
	Warranty	Min 1 Year	
44. Technical Specification of 4TB HDD			
	Manufacture, Country		
	Brand Name		

	Model No.		pcs
	Capacities	4 TB	
	Interface	SATA 6Gb/s	
	FEATURES AND PERFORMANCE		
	Max Sustained Transfer Rate OD (MB/s)	> 180MB/s	
	Hard Disk Rotational Speed	More than or equal 5400 RPM	
	Cache	64 MB or higher	
	Load/Unload Cycles	300,000	pcs
	Warranty	Min 1 Year	
45. Technical Specification of 2TB HDD			
	Manufacture, Country		
	Brand Name		
	Model No.		
	Capacities	2TB	
	Interface	SATA 6Gb/s	
	FEATURES AND PERFORMANCE		
	Max Sustained Transfer Rate OD (MB/s)	more than or equal to 180MB/s	
	Hard Disk Rotational Speed	More than or equal 5400 RPM	
	Cache	64 MB or higher	
	Load/Unload Cycles	300,000	
	Warranty	Min 1 Year	
46. Technical Specification of IP audio station			
	Manufacture, Country		pcs
	Brand		
	Model		
	Device Type	Professional digital audio recording and conference microphone/console system suitable for schools, classes, meetings, conferences, hearings, training and official proceedings	
	Microphone Type	Electret condenser microphone or equivalent professional microphone technology	
	Microphone Frequency Response	Minimum 50 Hz – 16 kHz	
	Microphone Sensitivity	Approximately -42 dB ± 2 dB, referenced to 0 dB = 1 V/Pa at 1 kHz, or equivalent/better	
	Microphone Output Impedance	Approximately 680 Ω at 1 kHz, or equivalent/better	
	Audio Recording Format	Support for MP3 and WAV or equivalent commonly supported uncompressed/compressed audio formats	
	Audio Recording Bit Depth	Minimum 16-bit	
	Audio Recording Bit Rate	Minimum 128 kbps for MP3 or equivalent/better quality	

	Two-Way Audio	Support for two-way audio communication with minimum G.711 or equivalent voice codec
	Echo Cancellation	Built-in Acoustic Echo Cancellation (AEC) or equivalent technology
	Internal Storage	Minimum 32 GB internal storage
	External Storage	Support for USB flash drive/external USB storage for audio file transfer and backup
	Maximum Audio File Size	Support for individual audio files of at least 100 MB or equivalent recording capacity
	Network Interface	Minimum 1 × RJ45 Gigabit Ethernet (10/100/1000 Mbps), auto-negotiating
	PoE	Support for IEEE 802.3at PoE+ (Class 4) or equivalent power delivery
	Audio Input – Microphone	Support for professional gooseneck/conference microphone input through suitable standardized connector/interface
	Audio Input – Line	Minimum 1 × Line-In, approximately 0 dBV, 10 kΩ, unbalanced, through 3.5 mm or equivalent connector
	Local Microphone Input	Built-in/local microphone input supported
	USB Interface	Minimum 3 × USB 2.0 or higher ports for USB storage/accessories
	Audio Output – Line	Minimum 1 × Line-Out, approximately 0 dBV, unbalanced, through 3.5 mm or equivalent connector
	Built-in Speaker	Integrated local speaker for audio monitoring/two-way communication
	Display	Integrated IPS or equivalent high-quality display
	Display Size	Minimum 10 inches or higher
	Display Resolution	Minimum Full HD (1920 × 1080) or equivalent/better
	Touch Screen	Capacitive touch-screen operation supported
	Power Supply	12 VDC and/or IEEE 802.3at PoE+
	Audio Processing	Digital audio processing with suitable noise reduction/automatic gain control or equivalent features
	Recording Management	Local recording, playback, file management and transfer through USB/network interface
	Network Functionality	Device configuration and audio/data communication through Ethernet network
	Compatibility	Shall support standard network and audio protocols/interfaces required for integration with compatible conference, recording and audio systems

pcs

	Accessories	Required power adapter, microphone/interface accessories, mounting/connection accessories and all necessary cables shall be supplied for complete operation	
	Warranty	Minimum 1 year warranty covering hardware defects and manufacturing faults	
	Service & Support	Supplier shall provide installation, configuration, testing and basic operational training where required	
47. Technical Specification of IP Wall/Ceiling Mouted Speaker			
	Manufacture, Country		pcs
	Brand		
	Model		
	Type	Network/IP wall/ceiling-mounted speaker	
	Speaker & Audio Performance	Minimum 5.25-inch speaker unit, rated power 10 W, impedance 8 Ω , sensitivity ≥ 90 dB (1 W/1 m), frequency response 100 Hz–18 kHz or better	
	Audio Quality	Minimum 48 kHz sampling rate, 16-bit resolution, SNR ≥ 80 dB; support AEC, AGC, ANS and DRC or equivalent digital audio processing	
	Audio Codec / Format	Support G.711 (A-law/ μ -law), MP3 or equivalent, with WAV/MP3 or equivalent audio file formats	
	Broadcast & Communication	Support regular, live and emergency broadcasting and two-way audio communication	
	Network & Protocols	1 $\times$ RJ45 10/100 Mbps Ethernet; support IPv4, TCP/UDP, HTTP/HTTPS, SIP, DHCP, DNS, NTP, IGMP and equivalent standard network protocols; ONVIF or equivalent open integration standard	
	Storage & Interface	Minimum 32 GB internal storage for audio files; minimum 1 $\times$ 3.5 mm audio input	
	Bluetooth	Bluetooth 5.0 or higher, with minimum approximately 10 m operating range	
	Compliance & Warranty	Applicable CE/RoHS or equivalent international safety/environmental compliance; minimum 1-year warranty, installation, configuration and testing included	
48. Technical Specification of IP Array Microphone			
	Manufacture, Country		
	Brand		
	Model		

	Type & Pickup	Network-enabled multi-microphone array, omnidirectional, with effective voice pickup radius of min. 8 m; built-in noise reduction and echo cancellation	pcs
	Audio Performance	Frequency response 20 Hz–16 kHz or better; SNR ≥90 dB; dynamic range ≥100 dB; AOP ≥120 dB SPL; THD ≤3%	
	Audio Sampling	Support 16/32/48 kHz sampling rates or better, suitable for high-quality voice/audio transmission	
	Network & Transmission	RJ45 Ethernet interface with PoE support; capable of transmitting audio streams to compatible IP cameras, DVR/NVR or other network audio systems; transmission distance ≥3 km over appropriate network/fiber infrastructure	
	Interfaces	Minimum RJ45 network port, Line-In, Line-Out and DC power input	
	Management & Monitoring	Network-based configuration and device monitoring, including power-off and operational/exception status detection	
	Operating Environment	Indoor operation, approximately -10°C to +50°C or better	
	Compatibility	Shall support standard network/audio protocols and interfaces for integration with compatible surveillance, public-address and recording systems	
	Warranty & Support	Minimum 1-year warranty, including installation, configuration, testing and necessary technical support	
49. Technical Specification of network audio processor			
	Manufacture, Country		
	Brand		
	Model		
	Type	Professional network audio processor/DSP suitable for conferencing, public-address and digital audio systems	
	Audio Processing	Minimum 48 kHz / 24-bit processing; support functions such as AEC, ANS, automatic mixing, matrix mixing, noise gate, compressor, delay, parametric EQ and automatic level control (ALC) or equivalent	
	Audio Inputs	Minimum 2 × balanced Line-In and 1 × 3.5 mm TRS auxiliary input, or equivalent	
	Audio Outputs	Minimum 2 × balanced Line-Out and 1 × 3.5 mm TRS auxiliary output, or equivalent	
	Audio Performance	Frequency response approximately 20 Hz–20 kHz or better; THD ≤0.1%; SNR ≥70 dB (A-weighted) or better	

	Network Interface	Minimum 4 × Gigabit Ethernet (RJ45) ports; support network audio/data transmission and PoE/PoE+ as applicable	pcs
	Network Audio & Protocols	Support RTP/RTSP/RTCP, TCP/IP, UDP, HTTP/HTTPS, NTP, QoS and AES67 or equivalent interoperable network-audio standard	
	PoE Output	Minimum 3 × PoE-capable ports for powering compatible external devices, with aggregate PoE output of approximately 40 W or better, where supported by the power supply	
	Storage & Memory	Built-in non-volatile storage of minimum 32 GB and sufficient system memory for reliable DSP/network operation	
	Power & Protection	Support PoE+ (IEEE 802.3at) and/or DC power input; built-in protection against overvoltage, overcurrent, overload and reverse polarity	
	Installation & Support	Suitable for professional indoor installation; supplier shall provide installation, configuration, testing and basic operational training; minimum 1-year warranty	
50. Technical Specification of Network Speaker			
	Manufacture, Country		pcs
	Brand		
	Model		
	Type & Speaker Units	Professional two-way network/IP speaker, comprising minimum 1 × 6.5-inch woofer and 1 × 1.2-inch tweeter, suitable for indoor public-address and audio distribution	
	Rated Power	Minimum 60 W; nominal impedance 4 Ω or equivalent	
	Audio Performance	Nominal sensitivity ≥90 dB (1 W/1 m); maximum SPL ≥106 dB @ 1 m; effective frequency bandwidth approximately 74 Hz–20 kHz (-10 dB) or better; THD <0.5%	
	Coverage & Processing	Horizontal coverage approximately 110° or better; digital crossover with PEQ, mixing, delay and automatic level/control functions or equivalent	
	Network & Audio	Minimum 1 × RJ45 Ethernet port (10/100 Mbps or better); support AES67 or equivalent interoperable network-audio standard, RTP/RTSP and standard TCP/IP network protocols	
	Audio Input	Network-based digital audio input with support for compatible network audio sources	

	Power	IEEE 802.3bt PoE++ or equivalent network power delivery, capable of supplying the required operating power	
	Installation & Warranty	Complete with necessary mounting/accessories, installation, configuration and testing; minimum 1-year warranty and technical support	
51. Technical Specification of Network Volume Controller			
	Manufacture, Country		pcs
	Brand		
	Model		
	Type	Network-based digital volume controller for centralized/remote control of compatible network audio devices	
	Control Function	Support one-to-one and one-to-many volume control through standard network communication/protocols	
	Device Capacity	Each control channel shall support control of at least 16 network audio devices; minimum 4 independent channels supporting up to 64 devices in total	
	Network Integration	Shall support network-based integration with compatible IP/network speakers and audio devices	
	Power Consumption	Maximum 3 W or equivalent energy-efficient design	
	Installation & Warranty	Complete with required accessories, installation, configuration and testing; minimum 1-year warranty and technical support	
52. Technical Specification of UHF RFID Reader			
	Manufacture, Country		pcs
	Brand		
	Model		
	Type	Fixed/long-range UHF RFID Reader suitable for access control, asset tracking and identification applications	
	RFID Standard	EPCglobal UHF Class 1 Gen 2 / ISO 18000-6C or equivalent internationally recognized standard	
	Reading Distance	Up to 5 m or better, depending on tag and installation conditions	
	Antenna	Integrated or external antenna support with gain of approximately 9 dBi or better	
	RF Output Power	Adjustable RF output power 19–30 dBm or equivalent/better	
	Communication Interface	Minimum Wiegand and RS-485 interfaces; equivalent standard communication interfaces may also be supported	

	Operating Mode	Continuous/always-on tag reading mode supported	
	Power Supply	9–15 V DC or equivalent suitable power input	
	Protection Rating	Minimum IP66 for protection against dust and water	
	Operating Environment	Operating temperature approximately -20°C to +65°C or better; suitable for indoor/outdoor installation	
	Warranty & Support	Minimum 1-year warranty, including installation, configuration, testing and technical support	
53. Technical Specification of UHF RFID controller			
	Manufacture, Country		pcs
	Brand		
	Model		
	Type	Network-enabled access control controller suitable for RFID/card-based access management	
	Processor & Memory	Embedded processor ≥ 1.0 GHz; RAM ≥ 128 MB; non-volatile storage ≥ 256 MB	
	Reader Capacity	Support minimum $4 \times$ RS-485 readers and $4 \times$ Wiegand readers, supporting 26/34/66-bit or equivalent Wiegand formats	
	User Capacity	Minimum 100,000 users/cardholders	
	Card Capacity	Minimum 100,000 cards/credentials	
	Transaction Capacity	Minimum 500,000 transaction/event records	
	Communication & Integration	Network communication and integration with compatible access-control management software; support standard/open communication interfaces or protocols	
	Power Supply	9.6–14.4 V DC or equivalent suitable DC power supply	
	Operating Environment	Operating temperature approximately 0°C to +45°C or better	
	Warranty & Support	Minimum 1-year warranty, including installation, configuration, testing and technical support	
54. Technical Specification of SDWAN Router			
	Manufacture, Country		
	Brand		
	Model		
	Device Type	Enterprise/SME-grade Router / Gateway / Multi-WAN Load Balancer, suitable for centralized network, Internet and VPN management	
	Ethernet Interfaces	Minimum $8 \times 10/100/1000$ Mbps RJ-45 ports and 1×1 Gbps SFP port or better	

	WAN Ports	Minimum 4 configurable WAN interfaces, supporting automatic failover and load balancing
	Processor & Memory	Minimum dual-core CPU, 1 GHz or higher and 256 MB RAM or higher
	Routing & VLAN	Support IPv4/IPv6, static routing, DHCP, NAT, VLAN 802.1Q, with VLAN ID range 1–4094
	Performance	Firewall/routing throughput of at least 550 Mbps under manufacturer-rated conditions; support 200 or more concurrent users/sessions as applicable
	VPN	Support IPsec, L2TP, PPTP and OpenVPN or equivalent secure VPN technologies; minimum 8 site-to-site VPN tunnels and 100 VPN users
	SD-WAN	Support SD-WAN or equivalent intelligent WAN management, including link selection, failover and traffic steering
	Load Balancing & Failover	Support multi-WAN load balancing and automatic failover; secondary-link recovery/failover shall be completed within 15 seconds or less under normal network conditions
	Network Management	Support standalone operation with web-based/GUI management. Cloud/centralized management may be supported but shall not be mandatory
	Network Access / Management	Support centralized management/control of compatible network devices such as switches and wireless access points, where supported by the proposed solution
	Bandwidth Management	Support application-based and user-based bandwidth management/QoS, including traffic prioritization and bandwidth limits
	Captive Portal	Built-in captive portal/hotspot functionality for user authentication and Internet access management
	Remote Access	Support secure remote management/access through dynamic/public or equivalent reachable addressing mechanisms, including operation in environments where a dedicated public IP is unavailable, subject to network conditions
	DDNS	Support DDNS or equivalent dynamic-address service; vendor-provided service may be included where available
	IPsec Performance	Minimum 25 Mbps IPsec VPN throughput or better under manufacturer-rated test conditions

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	Diagnostics & Security	Support packet capture, ping, traceroute, interface monitoring, traffic statistics, logs and network diagnostic tools for troubleshooting
	Network Protocols	Support standard protocols including TCP/IP, UDP, DNS, DHCP, NTP, HTTP/HTTPS, SNMP or equivalent network-management protocols
	Rack Mounting	1U rack-mountable or supplied with suitable rack-mounting accessories
	Standards & Certification	Manufacturer shall have applicable ISO 9001 or equivalent internationally recognized quality-management certification. Product shall comply with applicable safety and electromagnetic compatibility standards
	Warranty & Support	Minimum 1-year comprehensive warranty, including firmware/software updates, bug fixes, technical/telephone support and hardware replacement/RMA support.
55. Technical Specification of L2 access switch		
	Manufacture, Country	
	Brand	
	Model	
	Type	Managed Layer-2 Fiber Access Switch, suitable for enterprise/municipal network infrastructure
	Fiber Ports	Minimum 24 × 1 Gbps SFP ports
	Copper Ports	Minimum 8 × 10/100/1000 Mbps RJ45 combo ports
	Uplink Ports	Minimum 4 × 1/10 Gbps SFP+ uplink ports
	Switching Capacity	Minimum 128 Gbps
	Forwarding Rate	Minimum 95 Mpps
	MAC / ARP / Routing Table	MAC address table ≥16,000; ARP table ≥1,000; FIB table ≥500
	VLAN & Switching Features	Support 802.1Q VLAN, port-based/MAC-based VLAN, Voice VLAN, STP/RSTP, link aggregation (LACP), LLDP/LLDP-MED and IGMP Snooping v1/v2 or later
	Security & Protection	Support ACLs, DHCP/ARP protection, Dynamic ARP Inspection (DAI), hardware ARP checking, port protection and loop prevention
	ACL Capacity	Support IP standard/extended and Layer-2/port/MAC-based ACLs, with capacity of approximately 1,900 ACL entries or better
	Link Aggregation	Support minimum 16 Link Aggregation Groups (LAGs) using standard LACP or equivalent

	Network Management	Support standalone web/CLI management and, where available, centralized/cloud management. Cloud management shall not be mandatory	pcs
	Monitoring & Administration	Support Syslog, SNMP or equivalent network monitoring, remote port administration, port statistics and remote device reboot/management where supported	
	Additional Features	Support Auto Errdisable Recovery, EEE (Energy Efficient Ethernet), broadcast/multicast control and QoS or equivalent	
	Surge Protection	Minimum 6 kV surge/lightning protection, where applicable to the offered equipment and installation environment	
	Form Factor	19-inch rack-mountable, 1U or equivalent professional rack installation	
	Dimensions	Shall be suitable for standard 19-inch equipment rack; maximum dimensions approximately 440 × 358 × 44 mm (W×D×H)	
	Standards & Compliance	Shall support applicable IEEE Ethernet/VLAN/STP/LACP/PoE/networking standards relevant to the offered features and comply with applicable safety/EMC requirements	
	Warranty & Support	Minimum 1-year comprehensive warranty, including firmware/software updates, bug fixes, technical/telephone support and hardware replacement/RMA support	
55. Technical Specification of Layer 2 ethernet 8 PoE switch			
	Manufacture, Country		
	Brand		
	Model		
	Switch Type	Managed Layer-2 Ethernet PoE+ switch suitable for IP surveillance, networking and access-layer applications.	
	Switching Capacity	Should provide a minimum switching capacity of 20 Gbps or higher, or equivalent/better non-blocking switching performance.	
	Packet Forwarding Rate	Should provide a minimum packet forwarding rate of 15 Mpps or higher.	
	MAC Address Table	Should support at least 16,000 MAC addresses or equivalent/better.	
	Flash / Storage	Should have at least 8 MB non-volatile flash memory or equivalent capacity sufficient for firmware and configuration storage.	

	Network Interfaces	Minimum 8 × 10/100/1000BASE-T PoE+ ports, 2 × 10/100/1000BASE-T Ethernet ports, and 1 × 1 Gbps SFP port, or an equivalent/better combination providing equal or greater network connectivity.
	PoE Standard	PoE ports should comply with IEEE 802.3af/at or equivalent industry standard.
	PoE Budget	Minimum total PoE power budget of 120 W or higher, sufficient to support connected PoE devices.
	Surge / Lightning Protection	Should provide surge and electrical protection suitable for outdoor/PoE IP surveillance applications, with protection of up to 6 kV or better, where specified by the manufacturer.
	VLAN	Should support at least 32 VLANs and VLAN IDs in the range 1–4094, in accordance with IEEE 802.1Q.
	Loop Prevention	Should support loop prevention/detection mechanisms such as STP/RSTP or equivalent.
	DHCP Snooping	Should support DHCP Snooping or an equivalent DHCP security mechanism.
	IP Surveillance Support	Should provide features suitable for IP surveillance networks, including IP camera/device discovery or identification, traffic prioritization and/or equivalent surveillance-oriented management features.
	Storm Control	Should support broadcast, multicast and unicast storm control or equivalent traffic protection mechanism.
	Flow Control	Should support IEEE 802.3x Flow Control or equivalent.
	Port Isolation	Should support port isolation or equivalent Layer-2 traffic isolation functionality.
	Cable Diagnostics	Should support cable diagnostics/testing, such as VCT or equivalent functionality.
	CPU Protection	Should support CPU protection / Control Plane Protection (CPP) or an equivalent mechanism to protect the switch management/control plane from excessive traffic.
	Jumbo Frame	Should support jumbo frames with an MTU/frame size of at least 9,000 bytes or higher.
	Management	Should support web-based management and/or CLI-based management. SNMP support is preferred for centralized network monitoring.

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	Reset	Should have a physical reset mechanism/button for restoring factory-default configuration.
	Operating Temperature	Minimum operating temperature range should be 0°C to 40°C or wider.
	Standards Compliance	Should comply with applicable IEEE Ethernet, VLAN and PoE standards, including IEEE 802.3, 802.3u, 802.3ab, 802.3af/at and 802.1Q, as applicable.
	Warranty & Support	The proposed switch shall have a minimum 1-year warranty covering hardware defects, firmware/software updates available during the warranty period, bug fixes, technical/telephone support and hardware replacement/repair as applicable.
56. Technical Specification of Layer 2 ethernet 4 PoE switch		
	Manufacture, Country	
	Brand	
	Model	
	Switch Type	Managed Layer-2 Ethernet switch suitable for outdoor/industrial IP surveillance and network access applications.
	Switching Capacity	Minimum 14 Gbps or higher switching capacity, or equivalent/better non-blocking switching performance.
	Packet Forwarding Rate	Minimum 10 Mpps or higher packet forwarding rate.
	MAC Address Table	Minimum 2,000 MAC addresses or equivalent/better.
	Flash / Non-volatile Memory	Minimum 8 MB or equivalent capacity sufficient for firmware and configuration storage.
	SFP Interfaces	Minimum 2 × 1 Gbps SFP ports or equivalent/better fiber uplink connectivity.
	Copper Interfaces	Minimum 4 × 10/100/1000BASE-T PoE+ ports and 1 × 10/100/1000BASE-T non-PoE port, or an equivalent/better port configuration.
	PoE Standard	PoE ports shall comply with IEEE 802.3af/at or equivalent industry standard.
	PoE Power Budget	Minimum total PoE power budget of 60 W or higher.
	PoE Surge Protection	Shall provide PoE port surge protection of at least 6 kV or better, as specified by the manufacturer and suitable for the intended installation environment.
	Port Mirroring	Shall support port mirroring or equivalent traffic-monitoring functionality.

	Ring/Network Redundancy	Shall support ERPS, G.8032, or an equivalent Ethernet ring/network redundancy mechanism.	pcs
	Loop Prevention	Shall support loop prevention/detection, such as STP/RSTP or equivalent technology.	
	DHCP Snooping	Shall support DHCP Snooping or equivalent DHCP security functionality.	
	IP Surveillance Support	Shall provide features suitable for IP surveillance deployments, such as IP camera/device discovery or identification, traffic prioritization and/or equivalent surveillance-oriented management functionality.	
	Operating Temperature	Minimum operating temperature range of -30°C to +65°C, or wider.	
	VLAN	Shall support at least 32 VLANs with VLAN IDs in the range 1–4094, in accordance with IEEE 802.1Q.	
	Storm Control	Shall support broadcast, multicast and unicast storm control or equivalent traffic protection functionality.	
	CPU Protection	Shall support Control Plane Protection (CPP), CPU protection, or an equivalent mechanism.	
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.	
	Link Aggregation	Shall support static link aggregation/port aggregation or equivalent functionality.	
	Port Isolation	Shall support port isolation or equivalent Layer-2 traffic isolation.	
	Jumbo Frame	Shall support a jumbo-frame size/MTU of at least 9,000 bytes, preferably 9,216 bytes or higher.	
	Reset	Shall have a physical reset mechanism/button for restoring factory-default configuration.	
	Management	Shall support web-based and/or CLI-based management. SNMP or equivalent centralized monitoring capability is preferred.	
	Standards Compliance	Shall comply with applicable IEEE Ethernet, VLAN, PoE and network-management standards appropriate to the proposed equipment.	
	Warranty & Support	Minimum 1-year warranty covering hardware defects, firmware/software updates available during the warranty period, bug fixes, technical support and repair/replacement of defective hardware as applicable.	

57. Technical Specification of 10 port Layer 2 managed ethernet PoE switch			
	Manufacture, Country		pcs
	Brand		
	Model		
	Switch Type	Managed Gigabit Ethernet PoE+ switch suitable for IP surveillance, access networking and other enterprise/local network applications.	
	Switching Capacity	Minimum 20 Gbps switching capacity or equivalent/better non-blocking performance.	
	Packet Forwarding Rate	Minimum 14 Mpps packet forwarding rate or equivalent/better performance.	
	MAC Address Table	Minimum 4,000 MAC addresses or equivalent/better.	
	Packet Buffer	Minimum 1.5 Mbit packet buffer or equivalent/better buffering capability.	
	Ethernet Ports	Minimum 10 × 10/100/1000BASE-T Ethernet ports, of which at least 8 ports shall support IEEE 802.3af/at PoE+.	
	PoE Budget	Minimum total PoE power budget of 70 W or higher.	
	Surge Protection	Shall provide Ethernet/PoE surge protection of at least 4 kV or better, as specified by the manufacturer and suitable for the intended installation environment.	
	Loop Prevention	Shall support loop prevention/detection, such as STP/RSTP or equivalent functionality.	
	Port Protection	Shall support appropriate port security/protection mechanisms to prevent unauthorized access or abnormal traffic from affecting the network.	
	IP Surveillance Support	Shall provide IP surveillance-oriented functionality, including IP camera/device discovery or identification, traffic prioritization and/or equivalent functionality.	
	Reset	Shall provide a physical reset mechanism/button for restoring factory-default settings.	
	Long-Distance Ethernet	Shall support long-distance Ethernet transmission up to approximately 250 meters over compatible copper cabling, using the manufacturer's supported technology/mode where applicable.	
	Remote Port Reboot	Shall support remote power cycling/reboot of individual PoE ports through the management interface.	

	Device/Network Monitoring	Shall provide appropriate device/network monitoring functionality, including status monitoring and fault/event notification. Proprietary features may be accepted where they provide equivalent functionality.
	VLAN	Shall support at least 16 VLANs. VLAN IDs should comply with IEEE 802.1Q, where applicable.
	DHCP Security	Shall provide hardware/firmware-based protection against DHCP spoofing or unauthorized DHCP servers, such as DHCP Snooping or equivalent functionality.
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.
	Cable Diagnostics	Shall support cable testing/diagnostics for connected copper ports or equivalent functionality.
	Cloud Management	Shall support cloud-based/remote management through a secure management platform or equivalent remote-management mechanism.
	Web Management	Shall support web-based management through a standard web browser.
	Reliability / MTBF	The equipment should have an MTBF of at least 200,000 hours or equivalent reliability rating, based on the manufacturer's published specifications.
	Standards	Shall comply with applicable IEEE Ethernet, PoE, VLAN and network-management standards relevant to the proposed equipment.
	Warranty & Support	Minimum 1-year warranty, including hardware defect coverage, firmware/software updates available during the warranty period, bug fixes, technical support and repair/replacement of defective hardware as applicable.
58. Technical Specification of 11 port Layer 2 managed ethernet PoE switch		
	Manufacture, Country	
	Brand	
	Model	
	Switch Type	Managed Gigabit Ethernet PoE+ switch suitable for IP surveillance, access networking and enterprise/local network applications.
	Switching Capacity	Minimum 20 Gbps switching capacity or equivalent/better non-blocking switching performance.

	Packet Forwarding Rate	Minimum 14 Mpps packet forwarding rate or equivalent/better performance.
	MAC Address Table	Minimum 4,000 MAC addresses or equivalent/better.
	Packet Buffer	Minimum 1.5 Mbit packet buffer or equivalent/better buffering capability.
	Fiber Uplink	Minimum 1 × 1 Gbps SFP port for fiber connectivity.
	Copper Ports	Minimum 10 × 10/100/1000BASE-T Ethernet ports, of which at least 8 ports shall support PoE+.
	PoE Standard	PoE ports shall comply with IEEE 802.3af/at or equivalent industry standard.
	PoE Power Budget	Minimum total PoE power budget of 120 W or higher.
	Surge Protection	Shall provide at least 6 kV surge protection for Ethernet/PoE interfaces, or equivalent/better protection as specified by the manufacturer.
	Loop Prevention	Shall support loop prevention/detection, such as STP/RSTP or equivalent functionality.
	Port Protection	Shall support port security/protection mechanisms against unauthorized or abnormal network traffic.
	IP Surveillance Support	Shall provide IP surveillance-oriented functionality such as IP camera/device discovery or identification, traffic prioritization and/or equivalent functionality.
	Reset	Shall have a physical reset mechanism/button for restoring factory-default configuration.
	Long-Distance Transmission	Shall support Ethernet/PoE transmission up to approximately 250 meters over compatible copper cabling, using the manufacturer's supported long-distance transmission technology or equivalent.
	Remote PoE Port Reboot	Shall support remote power cycling/reboot of individual PoE ports through the management interface.
	Network/Device Monitoring	Shall support remote monitoring of connected devices and network status. Equivalent manufacturer-supported monitoring functionality shall be acceptable.
	VLAN	Shall support at least 16 VLANs with VLAN IDs in the range 1–4094 , in accordance with IEEE 802.1Q.

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	DHCP Security	Shall provide hardware/firmware-based protection against DHCP spoofing/unauthorized DHCP servers, such as DHCP Snooping or equivalent functionality.
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.
	Remote/WAN Management	Shall support secure remote/WAN management through a cloud management platform, centralized management system, or equivalent secure remote-management mechanism.
	Cloud Management	Shall support cloud-based management or equivalent centralized remote management functionality.
	Web Management	Shall support web-based management through a standard web browser.
	Reliability / MTBF	MTBF of at least 200,000 hours or equivalent/better reliability rating, based on the manufacturer's published specifications.
	Standards Compliance	Shall comply with applicable IEEE Ethernet, PoE, VLAN and network-management standards relevant to the proposed equipment.
	Warranty & Support	Minimum 1-year warranty covering hardware defects, firmware/software updates available during the warranty period, bug fixes, technical support and repair/replacement of defective hardware as applicable.
59. Technical Specification of 11 port Layer 2 managed ethernet PoE switch		
	Manufacture, Country	
	Brand	
	Model	
	Switch Type	Managed Gigabit Ethernet PoE+ switch suitable for IP surveillance, access networking and enterprise/local network applications.
	Switching Capacity	Minimum 20 Gbps switching capacity or equivalent/better non-blocking switching performance.
	Packet Forwarding Rate	Minimum 14 Mpps packet forwarding rate or equivalent/better performance.
	MAC Address Table	Minimum 4,000 MAC addresses or equivalent/better.
	Packet Buffer	Minimum 1.5 Mbit packet buffer or equivalent/better buffering capability.

	Fiber Uplink	Minimum 1 × 1 Gbps SFP port for fiber connectivity.
	Copper Ports	Minimum 10 × 10/100/1000BASE-T Ethernet ports, of which at least 8 ports shall support PoE+.
	PoE Standard	PoE ports shall comply with IEEE 802.3af/at or equivalent industry standard.
	PoE Power Budget	Minimum total PoE power budget of 120 W or higher.
	Surge Protection	Shall provide at least 6 kV surge protection for Ethernet/PoE interfaces, or equivalent/better protection as specified by the manufacturer.
	Loop Prevention	Shall support loop prevention/detection, such as STP/RSTP or equivalent functionality.
	Port Protection	Shall support port security/protection mechanisms against unauthorized or abnormal network traffic.
	IP Surveillance Support	Shall provide IP surveillance-oriented functionality such as IP camera/device discovery or identification, traffic prioritization and/or equivalent functionality.
	Operating Temperature	Minimum operating temperature range of 0°C to +40°C, or wider.
	Reset	Shall have a physical reset mechanism/button for restoring factory-default configuration.
	Long-Distance Transmission	Shall support Ethernet/PoE transmission up to approximately 250 meters over compatible copper cabling, using the manufacturer's supported long-distance transmission technology or equivalent.
	Remote PoE Port Reboot	Shall support remote power cycling/reboot of individual PoE ports through the management interface.
	Network/Device Monitoring	Shall support remote monitoring of connected devices and network status. Equivalent manufacturer-supported monitoring functionality shall be acceptable.
	VLAN	Shall support at least 16 VLANs with VLAN IDs in the range 1–4094, in accordance with IEEE 802.1Q.
	DHCP Security	Shall provide hardware/firmware-based protection against DHCP spoofing/unauthorized DHCP servers, such as DHCP Snooping or equivalent functionality.
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.

pcs

	Remote/WAN Management	Shall support secure remote/WAN management through a cloud management platform, centralized management system, or equivalent secure remote-management mechanism.
	Cloud Management	Shall support cloud-based management or equivalent centralized remote management functionality.
	Web Management	Shall support web-based management through a standard web browser.
	Reliability / MTBF	MTBF of at least 200,000 hours or equivalent/better reliability rating, based on the manufacturer's published specifications.
	Standards Compliance	Shall comply with applicable IEEE Ethernet, PoE, VLAN and network-management standards relevant to the proposed equipment.
	Warranty & Support	Minimum 1-year warranty covering hardware defects, firmware/software updates available during the warranty period, bug fixes, technical support and repair/replacement of defective hardware as applicable.
60. Technical Specification of 16 port managed PoE switch		
	Manufacture, Country	
	Brand	
	Model	
	Switch Type	Managed Gigabit Ethernet PoE+ switch suitable for IP surveillance, access networking and enterprise/local network applications.
	Switching Capacity	Minimum 36 Gbps switching capacity or equivalent/better non-blocking switching performance.
	Packet Forwarding Rate	Minimum 26 Mpps packet forwarding rate or equivalent/better performance.
	MAC Address Table	Minimum 8,000 MAC addresses or equivalent/better.
	Packet Buffer	Minimum 4 Mbit packet buffer or equivalent/better buffering capability.
	Copper Interfaces	Minimum 16 × 10/100/1000BASE-T Ethernet ports.
	PoE+ Ports	The switch shall provide PoE+ functionality on the required Ethernet ports in accordance with IEEE 802.3af/at or equivalent industry standards.
	PoE Power Budget	Minimum total PoE power budget of 240 W or higher.

	Fiber Uplink	Minimum 2 × 1 Gbps BASE-X SFP fiber ports, preferably dedicated/non-combo ports, or equivalent/better fiber uplink connectivity.
	Surge Protection	Shall provide Ethernet/PoE surge protection of at least 4 kV or better, as specified by the manufacturer and suitable for the intended installation environment.
	Loop Prevention	Shall support loop prevention/detection, such as STP/RSTP or equivalent functionality.
	Port Protection	Shall support port security/protection mechanisms against unauthorized access and abnormal traffic.
	IP Surveillance Support	Shall provide functionality suitable for IP surveillance networks, such as IP camera/device discovery or identification, traffic prioritization and/or equivalent surveillance-oriented functionality.
	Operating Temperature	Minimum operating temperature range of 0°C to +40°C, or wider.
	Reset	Shall have a physical reset mechanism/button for restoring factory-default configuration.
	Remote PoE Port Reboot	Shall support remote power cycling/reboot of individual PoE ports through the management interface.
	Network/Device Monitoring	Shall support remote monitoring of switch, port and connected-device status. Equivalent manufacturer-supported monitoring functionality shall be acceptable.
	DHCP Security	Shall provide hardware/firmware-based protection against DHCP spoofing or unauthorized DHCP servers, such as DHCP Snooping or equivalent functionality.
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.
	Remote/WAN Management	Shall support secure remote/WAN management through a cloud management platform, centralized management system, or equivalent secure remote-management mechanism.
	CWMP / TR-069	standard/manufacturer-supported remote device management mechanism, where applicable.
	Cloud Management	Shall support cloud-based management or equivalent centralized remote management functionality.
	Web Management	Shall support web-based management through a standard web browser.

pcs

	Rack Mounting	Shall be rack-mountable and suitable for installation in a standard 19-inch equipment rack, with a maximum height of 1U.	
	Environmental Compliance	Shall comply with RoHS or equivalent applicable environmental requirements.	
	Standards Compliance	Shall comply with applicable IEEE Ethernet, PoE, VLAN and network-management standards relevant to the proposed equipment.	
	Warranty & Support	Minimum 1-year warranty covering hardware defects, firmware/software updates available during the warranty period, bug fixes, technical support and repair/replacement of defective hardware as applicable.	
61. Technical Specification of 20 port managed PoE switch			
	Manufacture, Country		pcs
	Brand		
	Model		
	Switch Type	Managed Gigabit Ethernet PoE+ switch suitable for IP surveillance, access networking and general enterprise/local network applications.	
	Switching Capacity	Minimum 40 Gbps switching capacity or equivalent/better non-blocking switching performance.	
	Packet Forwarding Rate	Minimum 29 Mpps packet forwarding rate or equivalent/better forwarding performance.	
	Copper Ports	Minimum 16 × 10/100/1000BASE-T PoE+ ports and 2 × 10/100/1000BASE-T non-PoE ports.	
	Fiber Uplink	Minimum 2 × 1 Gbps SFP uplink ports or equivalent/better fiber connectivity.	
	PoE Standard	PoE+ ports shall comply with IEEE 802.3af/at or equivalent industry standard.	
	PoE Power Budget	Minimum total PoE power budget of 130 W or higher.	
	Flow Control	Shall support IEEE 802.3x Flow Control or equivalent.	
	Storm Control	Shall support broadcast, multicast and/or unicast storm control or equivalent traffic protection functionality.	
	VLAN	Shall support port-based VLAN and IEEE 802.1Q VLAN functionality.	
	VLAN Capacity	Shall support at least 16 VLANs with VLAN IDs in the range permitted by IEEE 802.1Q.	
	MAC Address Table	Shall support at least 8,000 MAC addresses or equivalent/better.	

	Speed/Duplex	Shall support 10/100/1000 Mbps auto-negotiation and full/half-duplex operation as applicable to the interface and IEEE standards.	
	DHCP Snooping	Shall support DHCP Snooping or equivalent protection against unauthorized DHCP servers/DHCP spoofing.	
	DHCP Client	Shall support DHCP client functionality for obtaining management/network configuration automatically.	
	Loop Prevention	Shall support automatic loop detection/prevention, such as STP/RSTP or equivalent functionality.	
	Port Mirroring	Shall support port mirroring for network monitoring and troubleshooting.	
	Management Protocol	Shall support HTTP/HTTPS-based web management or equivalent secure web-management functionality. HTTPS is preferred.	
	Cloud Management	Shall support cloud-based management at no additional recurring license cost during the warranty/support period, or an equivalent centralized remote-management facility.	
	Management	Shall support local web-based management and remote management through an appropriate secure management platform.	
	Warranty	Minimum 1-year warranty covering hardware defects and repair/replacement as applicable.	
62. Technical specification of ethernet cable			
	Brand		drum
	Model		
	Cable type	UTP, 4 pair	
	Conductor material	CCA	
	Ethernet name	100BaseT or higher	
	Speed	100Mbps or higher	
	Packing Length	300mtr or more	
	Cable name	Cat5 or cat6	
63. Technical specification of ethernet cable (pure copper)			
	Brand		drum
	Model		
	Cable type	UTP, 4 pair	
	Conductor material	pure copper	
	Speed	10/100/1000 Mbps	
	Bandwith	upto 250 MHz or higher	
	Packing Length	300mtr or more	
	Cable name	Cat5 or cat6	
64. Technical specification of optical fiber cable			
	Brand	To be specified by bidders	
	Fiber type	Single Mode Fiber	

	Number of fiber per loose tube	6F	mtr
	Fiber attenuation	≤ 0.36 dB/km at 1310 nm and ≤ 0.22 dB/km at 1550 nm	
	Loose tube	1	
65. Technical Specification of PoE with SFP ports			
	Brand		pcs
	Manufacturer,Country		
	Model		
	Ports	4 x 10/100/1000Mbps PoE ports, and and 2 × 10/100/1000 Mbps SFP ports.	
	Layer Type	Unmanaged	
	switching capacity	10 Gbps or higher	
	Forwarding rate	8 Mbps or higher	
	Forwarding mode	Store and forward switching	
	MAC address table	2000	
	Surge Protection	6kV	
	Warranty	1 year+	
66. Technical specification of SFP module (pair)			
	Type	SFP pair	pair
	Data Rate	1.25 Gbps or better	
	Fiber Type	Single Mode Fiber	
	Transmission distance	min. 10 KM	
	Form Factor	Standard SFP, MSA compliant or equivalent	
	Accessories	Dust caps/plugs	
	Warranty	Minimum 1 year	
67. Technical specification of SFP+ module(pair)			
	Type	SFP+ pair	pair
	Data Rate	10 Gbps	
	Fiber	Single Mode Fiber	
	Transmission distance	min. 10 KM	
	Warranty	Minimum 1 year	
68. Technical specification of PoE switch(4+2)			
	Brand		pcs
	Manufacturer,Country		
	Model		
	Ports	4 x 10/100Mbps PoE ports, and and 2 × 10/100Mbps RJ45 ports.	
	Layer Type	Unmanaged	
	switching capacity	min. 1.2 Gbps or higher	
	Forwarding rate	min. 0.75 Mbps or higher	
	Forwarding mode	Store and forward switching	
	MAC address table	2000	
	Surge Protection	4kV	
	Warranty	1 year+	
69. Technical specification of PoE switch(8+2)			
	Brand		
	Manufacturer,Country		

	Model		pcs
	Ports	8x 10/100Mbps PoE ports, and 2 × 10/100/1000Mbps RJ45 ports.	
	Layer Type	Unmanaged	
	switching capacity	5 Gbps or higher	
	Forwarding rate	4 Mbps or higher	
	Forwarding mode	Store and forward switching	
	MAC address table	3000	
	Surge Protection	6kV	
	Warranty	1 year	
70. Technical specification of Desktop network switch (5 ports)			
	Brand		pcs
	Manufacturer,Country		
	Model		
	Ports	5 x 10/100Mbps RJ45 ports.	
	Fan	Fanless or fan	
	Warranty	1 year	
71. Technical specification of Desktop network switch (8 ports)			
	Brand		pcs
	Manufacturer,Country		
	Model		
	Ports	8 x 10/100Mbps RJ45 ports.	
	Fan	Fanless or fan	
	Warranty	1 year	
72. Technical specification of media converter			
	Interface	1×RJ45 ethernet port and 1× optical fiber or better	pcs
	Distance	minimum 10KM	
	Speed	10/100 Mbps or better	
	Warranty	Minimum 1 year	
73. Technical Specification of access point			
	Manufacturer,Country		pcs
	Brand		
	Model		
	Interface	2 x 10/100 Base-T	
	users support	minimum 30 concurrent wireless clients, supporting both 2.4GHz and 5 GHz	
	power consumption	not exceeding 10 W	
	Antenna	Built in Omni directional antennas	
	Mounting option	ceiling/wall	
	mangement	Web based management and/or centralized/cloud-based management	
	remote monitoring and maintenance	yes	
	SSID support	minimum 8 SSIDs	
	Performance	Minimum 1.2Gbps combined theoretical wireless throughput or better	
	Accessories	Mounting accessories	

	Warranty	1 years	
74. Technical Specification of Dual Band Wi-Fi Access Point			
	Manufacturer,Country		pcs
	Brand		
	Model		
	Type	Indoor Dual-Band Wireles Access Point	
	Wireless standard	IEEE 802.11a/b/g/n/ac or better	
	Frequency	Simultaneous 2.4 GHz and % Ghz dual-band	
	Radio	Dual-radio, 2×2 MIMO or better	
	Concurrent user	minimum 60 concurrent users	
	SSID support	minimum 8 SSIDs	
	Aggregate wireless throughput	Minimum 1.2 Gbps theoretical throughput or better	
	Ethernet ports	Minimum 2×10/100/1000 Mbps RJ45 ports(GE)	
	Antenna	Built in Omni directional antennas	
	Remote management	Remote monitoring, configuration and maintenance supported	
	Mounting option	ceiling/wall	
	Accessories	Mounting accessories	
	Warranty	Minimum 1 year	
75. Technical Specification of Printer			
	Manufacturer,Country		pcs
	Brand	Branded	
	Model	LBP 6030 or equivalent	
	Printing Type	Monochrome Laser Printer	
	Function	Print only	
	Printing Speed	greater than 17 ppm	
	Connectivity	High Speed USB 2.0	
	Paper size	A4	
	Memory capacity	32 MB	
	Warranty	min. 1 years	
76. Technical Specifiation of Color multifunction Printer			
	Manufacturer,Country		pcs
	Brand		
	Model		
	Core functions	Print, Scan, Copy	
	Technology	Continuous Refillable Integrated Ink Tank System with transparent facing reserviors	
	Ink System	1×Black, 1×Cyan,1×Magenta,1×yellow	
	Print Resolution	Minimum 4800×1200 dpi or equivalent high resolution output	
	Print Speed (A4)	Document speed of at least 8.8 ipm in monochrome and 5.0 ipm in color	
	Photo printing	Supports photo printing	
	Scanner Type	Flatbed scanner using contact image sensor	
	Optical Scan Resolution	minimum 600×1200 dpi	
	Supported media sizes	Must support A4,A5,B5, letter	

	Connectivity	Hi-Speed USB 2.0 port interface	
	Warranty	Minimum 1 year	
77. Technical Specification of Inkjet printer			
	Manufacturer,Country		pcs
	Brand		
	Model		
	Core functions	Print, Scan, Copy	
	Technology	Continuous Refillable Integrated Ink Tank System with transparent facing reservoirs	
	Ink System	1×Black, 1×Cyan,1×Magenta,1×yellow	
	Print Resolution	upto 1200×6000 dpi or equivalent high resolution output	
	Print Speed (A4)	Document speed of at least 15 ipm in monochrome and 8.0 ipm in color	
	Photo printing	Supports photo printing	
	Scanner Type	Flatbed scanner using contact image sensor	
	Optical Scan Resolution	upto 19200×19200 dpi	
	Supported media sizes	Must support A4,A5,B5, A6	
	Connectivity	Hi-Speed USB 2.0 port interface	
	Warranty	Minimum 1 year	
78. Technical Specification of A3 monochrome laser printer			
	Brand		pcs
	Model		
	Type	Monochrome Laser Printer	
	Core functions	Print	
	Technology	Laser/Electrophotographic printing technology	
	Print Resolution	600×600 dpi or equivalent high resolution output	
	Print Speed	min 28 ppm for A4 and 13 ppm for A3	
	Supported media sizes	Supports upto A3	
	Connectivity	Hi-Speed USB 2.0 port interface and 1FE RJ45	
	Service Center	Should have Authorized Service Centers in Nepal	
	Warranty	Minimum 1 year	
79. Technical Specification of managed PoE switch			
	Brand		pcs
	Model		
	Type	Layer-2 managed ethernet PoE switch	
	PoE Ports	Minimum 16×10/100 Mbps RJ45 PoE ports	
	Uplink Ports	Minimum 2 Gigabit RJ45/SFP	
	Switching Capacity	min 7 Gbps each port	
	Forwarding rate	min 6.5 Mpps	
	PoE standard	IEEE 802.3af and IEEE 802.3at compliant	
	PoE port power	min 25W per PoE port	
	Features	PoE watchdog, Link aggregation, QoS, Loop Prevention	
	MAC address table	min. 16000	

	Forwarding method	store and forward	pcs
	VLAN	greater than or equal to 4000 IDs supported	
	Surge protection	min 4kV surge protection on PoE ports	
	Standards	IEEE 802.3, 802.3u, 802.3x, 802.3af and 802.3at or equivalent/latest applicable standards	
	Certifications	Equipment shall comply with applicable safety, EMC and RoHS requirements	
	Application	suitable for IP CCTV surveillance, AP and other PoE applications	
	Accessories	all required accessories for installation	
	Warranty	Min. 2 year sales and service	
80. Technical Specification of Managed layer 3 Gigabit switch			
	Type	Managed Layer 3 Ethernet switch	pcs
	Ports	Minimum 48×10/100/1000 Mbps Rj-45 ports	
	PoE	IEEE 802.3af/802.3at PoE+ on all 48 RJ-45 ports	
	PoE power	minimum 350 W	
	Uplink Ports	Minimum 4 × 1/10 Gbps SFP+ ports	
	Switching Capacity	Minimum 160 Gbps	
	Forwarding rate	Minimum 120 Mpps	
	VLAN	greater than or equal to 4000 VLAN IDs supported	
	Layer 3 routing	IPv4/IPv6 static routing and OSPF support	
	Management	CLI, Web, SNMP and SSH/HTTPS management	
	MAC address table	greater than or equal to 16000	
	ARP table	greater than or equal to 4000	
	Fan	One fixed fan module	
	Console	Minimum 1 console port	
	PoE Power	Greater than or equal to 25W each PoE	
	Power	100–240 VAC, 50/60 Hz internal power supply	
	Certifications	IEC 62368-1, IEEE 802.3-2005 Ethernet standard, RoHS	
	Accessories	all required accessories for installation	
	Warranty	Minimum 2 years sales and service	
81. Technical Specification of Laptop			
	Manufacturer, Country		
	Brand		
	Model		
	Processor	Intel core ultra 9 275HX min. 24 cores or equivalent or higher	
	Graphics	RTX 5070Ti 12GB GDDR7 or equivalent or higher	
	RAM	32 GB DDR5 6400MHz or equivalent or higher	
	Storage	1 TB SSD	
	Display	15.6 inch WQXGA, OLED or equivalent or higher	

	AI	yes integrated	pcs
	Refresh rate	min. 230 Hz or higher	
	Audio	Yes	
	Wireless	Wifi 6 and bluetooth 5.4 or equivalent or higher	
	Interface	min. 3×USB3.2-A, 1×USB3.2-C, 1×HDMI,1×audio jack, 1×RJ45	
	Battery	min. 76 Wh	
	Keyboard	RGB	
	Camera	min. 1080 FHD IR camera	
	Accessories	Power adapter,wireless mouse and other required accessories	
	Warranty	Mininum 1 year	

82. Technical Specification of Laptop

	Manufacturer, Country		pcs
	Brand		
	Model		
	Processor	Intel core ultra 9 275HX min. 24 cores or equivalent or higher	
	Graphics	RTX 5070Ti 12GB GDDR7 or equivalent or higher	
	RAM	32 GB DDR5 6400MHz or equivalent or higher	
	Storage	1 TB SSD	
	Display	15.6 inch WQXGA, IPS or equivalent or higher	
	AI	yes integrated	
	Refresh rate	min. 230 Hz or higher	
	Audio	Yes	
	Wireless	Wifi 6 and bluetooth 5.4 or equivalent or higher	
	Interface	min. 3×USB3.2-A, 1×USB3.2-C, 1×HDMI,1×audio jack, 1×RJ45	
	Battery	min. 76 Wh	
	Keyboard	RGB	
	Camera	min. 1080 FHD IR camera	
	Accessories	Power adapter,wireless mouse and other required accessories	
	Warranty	Mininum 1 year	

Accessories

83	Drone	as per specification sheet attached herewith	set
84	Power Supply Adapter	36 V , compatible with hikvision darkfigheter camera	
85	Power Supply Adapter	AC voltage: 100-240V, 50/60Hz, Output/Input:1400W, DC voltage: 240V ; Compatible for Dell Powerededge R750xs server	
86	Wall Mount network Rack	6U Wall Mount Single Section Network cabinet with accessorie	

87	9U Rack	9U Wall Mount Network Rack, 600-400 mm or equivalent, 19-inch standard, IP20, IK08 or better, CRCA/SPCC steel with powder-coated finish, lockable glass front door, 4 mounting rails, single cooling fan or better.	
88	LAN Socket	Double	
89	Surface Box	3×3 inch	
90	2 Core Drop wire (30M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 30 meter	roll
91	2 Core Drop wire (50M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 50 meter	roll
92	2 Core Drop wire (100M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 100 meter	roll
93	2 Core Drop wire (150M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 150 meter	roll
94	2 Core Drop wire (200M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 200 meter	roll
95	2 Core Drop wire (300M)	2 Core Drop wire Pre-terminated with suitable fiber port with support with length of 300 meter	roll
96	6 Core Optical fiber cable (with laying charge)	6 Core Optical fiber cable with messenger 10/12 rod (with laying charge)	mtr
97	6 Core Optical fiber cable with messenger	6 Core Optical fiber cable with messenger	mtr
98	12 Core Optical fiber cable with messenger	12 Core Optical fiber cable with messenger 10/12 rod (with laying charge)	mtr
99	12 Core Optical fiber cable (with laying charge)	12 Core Optical fiber cable (with laying charge)	mtr
100	Optical fiber splice box	Heavy-duty indoor/outdoor fiber splice enclosure with minimum 6-core splice capacity, UV-resistant ABS engineering plastic body, dust and moisture resistant (IP65 or better), cable entry/exit ports, Integrated splice tray, wall-mount support, complete mounting accessories	pcs
101	Media Converter	Product Type: Gigabit Fiber to Ethernet Convertor	pcs
102	Fiber Patch Cord (5 Meter)	Product Type: 5 meter fiber Patch with SC-SC or SC-LC or LC-LC connector or better	pcs
103	Fiber Patch Cord (10 Meter)	Product Type: 10 meter fiber Patch with SC-SC or SC-LC or LC-LC connector or better	pcs
104	Type C to LAN adapter	Product Type: Type C to Gigabit Ethernet Convertor	pcs

105	USB to LAN adapter	Product Type: USB to Ethernet Converter	pcs
106	Wireless HDMI Transmitter and Receiver	5 GHz wireless HDMI extender supporting Full HD resolution up to 1920x1080 at 60 Hz, HDMI 1.4 or better, HDCP 1.4, wireless transmission distance up to 50 meters, plug-and-play operation, transmission of high-quality video and audio, HDMI input/output, USB-C power supply, compatible with laptops, PCs, projectors, monitors and TVs, including required cables and accessories, with 1-year warranty or more	pcs
107	HDMI Cable 3 mtr	3 Meters, HDMI Cable 4k high speed for all HDMI Devices, Laptop, computer, UHD TV, Monitor, Projector	pcs
108	HDMI Cable 5 mtr	5 Meters, HDMI Cable 4k high speed for all HDMI Devices, Laptop, computer, UHD TV, Monitor, Projector	pcs
109	HDMI Cable 10 mtr	10 Meter HDMI Cable 4k high speed for all HDMI Devices, Laptop, computer, UHD TV, Monitor, Projector	pcs
110	HDMI Cable 15 mtr	15 Meter HDMI Cable 4k high speed for all HDMI Devices, Laptop, computer, UHD TV, Monitor, Projector	pcs
111	Fiber Splicing	Fiber Splicing, testing and fiber cable management per splicing (per core)	pcs
112	Networking Wiring (without bit wiring)	Laying of Cat 6 Cable, Power Cable, Optical Fiber, testing and tagging per meter (without bit wiring)	mtr
113	Networking Wiring (with bit wiring)	Network cable-CAT 6/Power Cable/Optical Fiber laying in PVC duct, Pipe, crimping, testing and labeling per meter (with bit wiring including listic)	mtr
114	Network Cabling per point	Network cable laying through PVC duct/pipe, routing, termination/crimping, labeling, continuity testing and commissioning per point	pcs
115	Wiring Cabling per point	Wiring and Cable Management (Cable laying, routing, dressing, bundling, fixing, labeling and proper management of network/power other cables, including testing) Per point	pcs
116	CCTV Camera Installation	Installation of CCTV Camera-Indoor and Outdoor (Bullet/Dome/PTZ/Wireless Camera) Mounting, basic bracket installation, Cable termination, POE Power Connection, IP Configuration, NVR/VMS Connection, Camera angle adjustment, Testing and Commissioning per camera)	pcs

117	ANPR CCTV Camera Installation	Installation of ANPR CCTV Camera Site Survey, Camera Mounting, Network and Power Installation, ANPR Configuration, NVR/VMS Server Integration, Testing and Commissioning fiber and cable laying per camera)	pcs
118	Projector	DLP, XGA 1024 x 768 pixels, 3500 Lumens or better	pcs
119	Projector	DLP, WXGA, 1280 x 800 pixels, 4000 Lumens or better	pcs
120	Projector Screen	120" diagonal, 4:3 ratio	pcs
121	External Harddisk (HDD)	2 TB	pcs
122	External Harddisk (HDD)	1 TB	pcs
123	External Harddisk (SSD)	2 TB	pcs
124	External Harddisk (SSD)	1 TB	pcs
125	External Harddisk (SSD)	512 GB	pcs
126	Internal hard Disk (SSD)	1 TB	pcs
127	Internal hard Disk (SSD)	512 GB	pcs
128	SSD M.2 SATA	1 TB	pcs
129	SSD M.2 SATA	512 GB	pcs
130	ATX Power supply	450W/500W	pcs
131	Computer Keyboard	English/Nepali, USB/PS2	pcs
132	Laptop Keyboard	USB Wired Keyboard (English International Keyboard)	pcs
133	Wireless Keyboard	Wireless Keyboard (English International Keyboard)	pcs
134	Wireless Keyboard & Mouse	(Combo Pack)	pcs
135	Wired mechanical keyboard	Wired mechanical keyboard with clicky mechanical switches, full-size QWERTY layout including numeric keypad, N-key rollover, tactile and audible key feedback, per-key customizable RGB backlighting with multiple lighting effects, durable plastic body with metal top plate or better, multimedia function keys, USB Type-A wired connectivity, compatible with Windows and macOS, and minimum 1-year full product warranty	pcs
136	Computer Mouse Pad	Simple	pcs
137	Wireless Mouse	Wireless Support	pcs
138	Computer Mouse	Optical USB/PS2	pcs
139	Desktop RAM	8 GB DDR4	pcs
140	Desktop RAM	8 GB DDR5	pcs

141	Desktop RAM	16 GB DDR5	pcs
142	Laptop RAM	4 GB DDR4	pcs
143	Laptop RAM	8 GB DDR4	pcs
144	Laptop RAM	16 GB DDR4	pcs
145	Laptop RAM	8 GB DDR5	pcs
146	Laptop RAM	16 GB DDR5	pcs
147	55" 4K Smart TV	Size 55" 4K(3840 x 2160 pixels) Smart TV, 1 GB RAM, 8 GB ROM, Audio Power 2x 5W speaker, Connectivity: 1 HDMI, 2 USB, LAN, Refresh Rate-60Hz(min), Wall mount with basic required accessories, HDMI cable, Remote Control Min. 1 year warranty	pcs
148	32 Inch FHD Smart TV	Size-32 Inch, Android 14, FHD (1366*768) Resolution, Refresh Rate: 60Hz(min), HDMI Input: 2 USB Input: 2, Audio Power 25W, Installation with required accessories, HDMI cable, Remote Control Min 1 year warranty	pcs
149	Trolley with Stand for LED SMART Board	Smart Board Mobile Trolley Stand, Heavy-Duty Steel Construction, Compatible with 65-86 Inch Interactive Flat Panel Displays, VESA Compatible, Lockable Heavy-Duty Caster Wheels, Adjustable Height, Minimum Load Capacity 100 kg or Higher, Powder Coated Finish, Complete with Mounting Hardware	pcs
150	Trolley Speaker 8"	Speaker Size 8 Inch, Sound Output 30W, Wireless Mic, Mic Input, 1 Year Warranty, 6 Months on Battery	pcs
151	Trolley Speaker 12"	Speaker Size 12 Inch, Sound Output 40W, Bluetooth, Mic Input, Rechargeable Battery, 2 wireless Mic, USB, TF card function, 1 Year Warranty, 6 Months Battery	pcs
152	Branch Firewall Device	Throughput 350 Mbps or higher, IPS Throughput 100 Mbps or higher, VPN Throughput 50 Mbps or higher, Minimum 4 Gigabit Ethernet ports, Concurrent sessions 30000 or higher	pcs
153	VGA Cable	1.5 Meters	pcs
154	VGA Cable	3 Meters	pcs
155	Portable Speaker	For Computer and Laptop, 5W (minimum) total output with 2.0 channel USB plug, Frequency response of 20Hz-20KHz	pcs
156	SD Card 8GB	Class 10 /Read Write speed-100/90 mbps, high/low temperature resistant, water proof, anti-magnetic	pcs
157	SD Card 16 GB	16 GB Read/Write speed-100/90 mbps, high/low temperature resistant, water proof, anti-magnetic	pcs

158	SD Card 32 GB	32 GB Read/Write speed-100/90 mbps, high/low temperature resistant, water proof, anti-magnetic	pcs
159	SD Card 64GB	64 GB, Read Speed: Up to 100 MB/s, Write Speed: Up to 90 MB/s, Speed Class C10/U3/V30, File System-exFAT, Suitable for CCTV, Warranty-Min 1 Year	pcs
160	SD Card 128GB	128 GB, Read Speed: Up to 100 MB/s, Write Speed: Up to 90 MB/s, Speed Class C10/U3/V30, File System-exFAT, Suitable for CCTV, Warranty-Min 1 Year	pcs
161	64 GB Pendrive	Interface USB 3.0, transfer speed of up to 100 MB/s, USB Connector Type: Standard, Warranty 1 year	pcs
162	32 GB Pendrive	Interface USB 3.0, transfer speed of up to 100 MB/s, USB Connector Type: Standard, Warranty 1 year	pcs
163	16 GB Pendrive	Interface USB 3.0, transfer speed of up to 100 MB/s, USB Connector Type: Standard, Warranty 1 year	pcs
164	8 GB Pendrive	Interface USB 3.0, transfer speed of up to 100 MB/s, USB Connector Type: Standard, Warranty 1 year	pcs
165	Telephone Wire	2 pair, 1 roll 100m	pcs
166	Telephone Wire	1 pair	pcs
167	RJ45 LAN Cable Tester	Network Cable Tester Rj45 Rj11 Rj12 Cat5 UTP Lan Cable Tester Networking Tool, Led indication	pcs
168	CCTV PVC Junction Box (3" x 3")	Size 3"x3" (75x75 mm), High-Quality PVC Construction, Weather-Resistant, Suitable for Indoor and Outdoor CCTV Camera Installations, Cable Entry Provision, Surface Mount Type, White or Equivalent Color	pcs
169	CCTV PVC Junction Box (4" x 4")	Size 4"x4" (100x100 mm), High-Quality PVC Construction, Weather-Resistant, Suitable for Indoor and Outdoor CCTV Camera Installations, Cable Entry Provision, Surface Mount Type, White or Equivalent Color	pcs
170	Metal Pole Box	Type: Outdoor, dimensions approximately 320x280x215 mm, water and dust proof, equipped with locking mechanism, cable knockouts, and mounting provisions	pcs
171	Waterproof PVC Junction box	Type: Outdoor, suitable for switch and power cables mounting, water and dust proof, equipped with locking mechanism, cable knockouts, and mounting provisions made by PVC	pcs

172	3 Kva online UPS	Type: online UPS, Capacity 3kVA / 48 V minimum, Input Voltage: 220-240V AC, single-phase, Output Voltage: Pure sine wave, 220-240V AC; Battery: Compatible with external battery bank; Protections: Overvoltage, undervoltage, short circuit, overload; Communication: Basic monitoring interface (RS232/USB); Display: Basic status indicators for power and battery; Operating Conditions: Suitable for typical office environment; Warranty: Minimum 1 year	pcs
173	5 Kva online UPS	Type: online UPS, Capacity 5kVA / 96 V minimum, Input Voltage: 220-240V AC, single-phase, Output Voltage: Pure sine wave, 220-240V AC; Battery: Compatible with external battery bank; Protections: Overvoltage, undervoltage, short circuit, overload; Communication: Basic monitoring interface (RS232/USB); Display: Basic status indicators for power and battery; Operating Conditions: Suitable for typical office environment; Warranty: Minimum 1 year	pcs
174	10 Kva online UPS	Type: online UPS; Capacity 10KVA / 192/240 VDC nominal, 8KW; Input Voltage: 220-240V AC, 1-phase; Output Voltage: Pure sine wave, 220-240V AC; Battery: Compatible with external battery bank; Protections: Overvoltage, undervoltage, short circuit, overload; Communication: Basic monitoring interface (RS232/USB); Display: Basic status indicators for power and battery; Operating Conditions: Suitable for typical office environment; Warranty: Minimum 1 year	pcs
175	Battery 100 ah Tubular	Capacity 100Ah, Type: Tubular Flooded Lead Acid, 12V nominal, Design Life: Minimum 5 years, Operating Temp: -5°C to 40°C, Maintenance: Low maintenance, Terminals: Bolt or Faston type; Standards: Compliant with IEC/IS or equivalent, Minimum 2 year replacement Warranty	pcs
176	Battery 150 ah Tubular	Capacity 150Ah, Type: Tubular Flooded Lead Acid, 12V nominal, Design Life: Minimum 5 years, Operating Temp: -5°C to 40°C, Maintenance: Low maintenance, Terminals: Bolt or Faston type; Standards: Compliant with IEC/IS or equivalent, Minimum 2 year replacement Warranty	pcs