

Pelco understands that information is critical to success, which is why we are singularly focused on the development of video surveillance and security solutions that provide you the information necessary to make real-time, business-enabling decisions. From the recently introduced VideoXpert video management platform to our industry-leading selection of IP cameras and accessories, Pelco is committed to designing and delivering a broad range of high-quality, IP video security products and systems complemented with an unparalleled level of customer support and services.

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# VIDEO MANAGEMENT SYSTEM

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

**28 20 00 Electronic Surveillance**

**28 23 00** **Video Surveillance**

 **28 23 29 Video Surveillance Control and Management Systems**

**Notes to Specifier:**

1. Where several alternative parameters or specifications exist, or where, the specifier has the option of inserting text, such choices are presented in **<bold text>.**

2. Explanatory notes and comments are presented in **colored** text.

**VIDEO MANAGEMENT SYSTEM**

## GENERAL

### SUMMARY

* + 1. Section includes an IP Video Management System.
		2. Related Requirements
			1. 27 20 00 Data Communications
			2. 28 05 00 Common Work Results for Electronic Safety and Security
				1. 28 05 13 Servers, Workstations and Storage for Electronic Safety and Security
				2. 28 05 33 Safety and Security Network Communications Equipment
				3. 28 05 45 Systems Integration and Unified Systems
			3. 28 06 20 Schedules for Video Surveillance
			4. 28 16 15 Access Control Interfaces to Video Surveillance
			5. 28 21 00 Surveillance Cameras
			6. 28 25 00 Video Surveillance Positioning Equipment
			7. 28 31 31.15 Intrusion Detection Interfaces to Video Surveillance
			8. 28 51 15.13 Information Interfaces to Video Surveillance Systems

### REFERENCES

* + 1. Abbreviations
			1. API – Applications Programming Interface
			2. DHCP – Dynamic Host Client Protocol
			3. FIPS – Federal Information Processing Standard
			4. FISMA - Federal Information Security Management Act
			5. GUI – Graphical User Interface
			6. IP – Internet Protocol
			7. JPEG – Joint Photographic Experts Group
			8. LDAP – Lightweight Directory Access Protocol
			9. MJPEG – Motion JPEG
			10. MPEG – Moving Pictures Experts Group
			11. NSM – Network Storage manager
			12. NTP – Network Time Protocol
			13. ONVIF – Open Network Video Interface Forum
			14. RMF – Risk Management Framework
			15. SNMP – Simple Network Management Protocol
			16. STIG – Security Technical Implementation Guides
			17. TLS – Transport Layer Security
			18. UPS – Uninterruptible Power Supply
			19. VMS – Video Management System
		2. Reference Standards
			1. Network
				1. IEEE 802.3 Ethernet Standards
			2. Video
				1. ISO / IEC 14496 –10, MPEG-4 Part 10 (ITU H.264 or H.265)
				2. ISO / IEC 10918 – JPEG
				3. ONVIF – Profile S
			3. Emissions
				1. FCC-47 CFR Part 15, Class A
				2. CE, Class A
				3. ICES-003, Class A
		3. Definitions
			1. Cell – A defined area within a tab.
			2. Playlist – A series of recorded video clips.
			3. Role - A group of permissions defining abilities and responsibilities within a system.
			4. Tab - A layout populated with sources, e.g., video and plugins.
			5. Tags - Custom attributes that users with sufficient rights can create and assign to cameras and devices, helping organize resources.
			6. Workspace - A collection of tabs spanning the monitors connected to a workstation.

### SUBMITTALS

* + 1. Informational Submittals
			1. Product Data
				1. Manufacturer’s printed or electronic data sheets
				2. Manufacturer’s installation and operation manuals
				3. Warranty documentation
			2. Password assignment plan
			3. Manufacturers Cyber Hardening Guidelines.
			4. Shop Drawings
		2. Closeout Submittals
			1. Final listing of devices and settings
			2. System test results
			3. Statement of compliance with Manufacturer Cyber Hardening Guidelines.

### QUALIFICATIONS

* + 1. Manufacturer shall have a minimum of five (5) years of experience in producing IP video application software.
		2. Installers shall be trained and authorized by the Manufacturer to install, integrate, test, and commission the system.

### DELIVERY, STORAGE AND HANDLING

* + 1. Store equipment in a temperature-controlled environment protected from mechanical and environmental conditions as designated by the manufacturer.

### WARRANTY, SUPPORT AND LICENSING

* + 1. Manufacturer shall provide a limited 3-year warranty for Manufacturer supplied hardware to be free of defects in material and workmanship. Extended warranty options for a period of up to two (2) additional years shall be available.
		2. Manufacturer shall provide software support and updates for a period of 12 months. Extended support options and extended software update options shall be available.

END OF SECTION

##  PRODUCTS

### EQUIPMENT

* + 1. Manufacturer: Pelco, Inc.

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 Web: www.pelco.com

 E-mail: sales@pelco.com

* + 1. **Models**
			1. **VMS: VideoXpert® Professional**
			2. **VideoXpert Professional Servers:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Range** | **Windows® OS** | **Raw Capacity** | **RAID level** | **Power Supply** | **Effective Storage (TB)** |
| **VXP-P2-96-6T** | **Power 2**  | **10 IoT** | **96 TB** | **RAID 6** | **Dual** | **72.70** |
| **VXP-P2-96-5T** | **Power 2** | **10 IoT** | **96 TB** | **RAID 5** | **Dual** | **79.97** |
| **VXP-P2-96-JT** | **Power 2** | **10 IoT** | **96 TB** | **JBOD** | **Dual** | **87.24** |
| **VXP P2-72-6T** | **Power 2** | **10 IoT** | **72 TB** | **RAID 6** | **Dual** | **50.89** |
| **VXP-P2-72-5T** | **Power 2** | **10 IoT** | **72 TB** | **RAID 5** | **Dual** | **58.16** |
| **VXP-P2-72-JT** | **Power 2** | **10 IoT** | **72 TB** | **J BOD** | **Dual** | **65.43** |
| **VXP-P2-48-6T** | **Power 2** | **10 IoT** | **48 TB** | **RAID 6** | **Dual** | **29.08** |
| **VXP-P2-48-5T** | **Power 2** | **10 IoT** | **48 TB** | **RAID 5** | **Dual** | **36.35** |
| **VXP-P2-48-JT** | **Power 2** | **10 IoT** | **48 TB** | **JBOD** | **Dual** | **43.62** |
| **VXP-P2-24-5T** | **Power 2** | **10 IoT** | **24 TB** | **RAID 5** | **Dual** | **14.54** |
| **VXP-P2-24-JT** | **Power 2** | **10 IoT** | **24 TB** | **JBOD** | **Dual** | **21.81** |
| **VXP-P2-0-XT** | **Power 2** | **10 IoT** | **0 TB** | **Unconfigured** | **Dual** | **N/A** |
| **VXP-P2-96-6N** | **Power 2**  | **Server 2019** | **96 TB** | **RAID 6** | **Dual** | **72.70** |
| **VXP-P2-96-5N** | **Power 2** | **Server 2019** | **96 TB** | **RAID 5** | **Dual** | **79.97** |
| **VXP-P2-96-JN** | **Power 2** | **Server 2019** | **96 TB** | **JBOD** | **Dual** | **87.24** |
| **VXP P2-72-6N** | **Power 2** | **Server 2019** | **72 TB** | **RAID 6** | **Dual** | **50.89** |
| **VXP-P2-72-5N** | **Power 2** | **Server 2019** | **72 TB** | **RAID 5** | **Dual** | **58.16** |
| **VXP-P2-72-JN** | **Power 2** | **Server 2019** | **72 TB** | **JBOD** | **Dual** | **65.43** |
| **VXP-P2-48-6N** | **Power 2** | **Server 2019** | **48 TB** | **RAID 6** | **Dual** | **29.08** |
| **VXP-P2-48-5N** | **Power 2** | **Server 2019** | **48 TB** | **RAID 5** | **Dual** | **36.35** |
| **VXP-P2-48-JN** | **Power 2** | **Server 2019** | **48 TB** | **JBOD** | **Dual** | **43.62** |
| **VXP-P2-24-5N** | **Power 2** | **Server 2019** | **24 TB** | **RAID 5** | **Dual** | **14.54** |
| **VXP-P2-24-JN** | **Power 2** | **Server 2019** | **24 TB** | **JBOD** | **Dual** | **21.81** |
| **VXP-P2-0-XN** | **Power 2** | **Server 2019** | **0 TB** | **Unconfigured** | **Dual** | **N/A** |
| **VXP-F2-28-6-S** | **Flex 2**  | **10 IoT** | **28 TB** | **RAID 6** | **Single** | **18.15** |
| **VXP-F2-28-5-S** | **Flex 2** | **10 IoT** | **28 TB** | **RAID 5** | **Single** | **21.78** |
| **VXP-F2-28-J-S** | **Flex 2** | **10 IoT** | **28 TB** | **JBOD** | **Single** | **25.41** |
| **VXP-F2-20-5-S** | **Flex 2** | **10 IoT** | **20 TB** | **RAID 5** | **Single** | **14.52** |
| **VXP-F2-20-J-S** | **Flex 2** | **10 IoT** | **20 TB** | **JBOD** | **Single** | **18.15** |
| **VXP-F2-8-J-S** | **Flex 2** | **10 IoT** | **8 TB** | **JBOD** | **Single** | **7.26** |
| **VXP-F2-4-J-S** | **Flex 2** | **10 IoT** | **4 TB** | **JBOD** | **Single** | **3.63** |
| **VXP-F2-0-J-S** | **Flex 2** | **10 IoT** | **0** | **JBOD** | **Single** | **N/A** |
| **VXP-E2-12-J-S** | **Eco 2** | **10 IoT** | **12 TB** | **JBOD** | **Single** | **10.89** |
| **VXP-E2-8-J-S** | **Eco 2** | **10 IoT** | **8 TB** | **JBOD** | **Single** | **7.26** |
| **VXP-E2-4-J-S** | **Eco 2** | **10 IoT** | **4 TB** | **JBOD** | **Single** | **3.63** |
| **VXP-E2-0-J-S** | **Eco 2** | **10 IoT** | **0 TB** | **JBOD** | **Single** | **N/A** |
| **VXP-E3-4-J-S** | **Eco 3** | **10 IoT** | **4 TB** | **JBOD** | **Single** | **3.63 TB** |
| **VXP-E3-8-J-S** | **Eco 3** | **10 IoT** | **8 TB** | **JBOD** | **Single** | **7.26 TB** |
| **VXP-E3-12-J-S** | **Eco 3** | **10 IoT** | **12 TB** | **JBOD** | **Single** | **10.89 TB** |
| **VXP-E3-24-J-S** | **Eco 3** | **10 IoT** | **24 TB** | **JBOD** | **Single** | **21.78 TB** |
| **VXP-E3-32-J-S** | **Eco 3** | **10 IoT** | **32 TB** | **JBOD** | **Single** | **29.10 TB** |
| **VX-WKST** | **Desktop Workstation**  | **10 IoT** | **N/A** | **N/A** | **Single** | **N/A** |
| **VX-RKWKST** | **Rackmount Workstation**  | **10 IoT** | **N/A** | **N/A** | **Single** | **N/A** |

* + 1. Alternates: None

### GENERAL DESCRIPTION

* + 1. The Video Management System (VMS) shall be a Microsoft Windows®-based video management and surveillance system consisting of two primary components, as follows:
			1. An IP video management system. This application shall:
				1. Maintain the database of cameras and recording devices and to provide a web-based administrative portal to manage the video surveillance system
				2. Route video traffic to users as requested and appropriate
				3. Record and store video from resources on the network.
			2. A client presentation application to allow users to view and manage live and recorded video.

### IP VIDEO MANAGEMENT SYSTEM DESCRIPTION

**Software system functions are based on using hardware that meets the minimum specifications. No performance guarantee is expressed or implied when the VMS is run on hardware that does not meet the minimum specifications.**

* + 1. The Video Management System (VMS) shall be a Microsoft Windows-based video management and surveillance system consisting in a single server performing the following functions:
			1. Allow users to define users and assign sets of permissions (known as roles) to each user.
			2. Record and store video per user-defined retention settings for up to 96 cameras per server
			3. Serve live and recorded video to clients on demand
		2. The IP video management system shall record video and audio streams from IP cameras and video encoders on the network.
			1. Video: MPEG4, MJPEG, H.264, or H.265 in High, Main, or Base Profile streams from both standard resolution and megapixel cameras
			2. Audio: Bidirectional, full or half duplex compressed via G.711 PCM 8 bit, 8khz mono at 64 Kbps.
		3. The system shall support recording schedules, including the ability to record based on motion, analytic, and alarm events.
		4. The IP video management system shall be capable of continuous scheduled alarm/event and motion recording. Pre- and post- alarm recording shall also be available and shall be fully programmable on a per channel basis.
		5. The IP video management system shall have the ability to record and playback audio streams along with associated video.
		6. The IP Video Management System shall support recording of primary or secondary streams, individually or simultaneously. The server application can be configured to record a stream in unicast or multicast.
		7. The IP Video Management System shall support video bookmarking, such that users can identify and recall important moments in recorded video based on the bookmark name or notes that are associated with it.
		8. The IP video management system shall allow the administrator to set minimum and maximum retention periods for recorded video.
		9. The IP video management system shall support network health and monitoring utilizing
		third-party SNMP monitoring tools.
		10. The IP video management system shall indicate system performance and operation status utilizing a variety of reports.
		11. The IP video management system shall log information for a report when an export action is performed. This includes username, camera name, start time, and end time of the video clip.
		12. The system shall be configurable remotely or over a network.
		13. The system shall discover **both Pelco and third-party** cameras on the network.
		14. The system shall allow users to manually add cameras and devices by IP address or DNS hostname.
		15. The system shall allow users with sufficient rights to control cameras (pan, tilt, and/or zoom).
		16. The system shall support aggregation by a higher-level system, tying multiple servers together in a single, unified environment.
		17. The system shall support third-party cameras using ONVIF profile S or native drivers.
		18. The IP VMS shall support Lightweight Directory Access Protocol (LDAP) to authenticate users.
		19. The IP video management system shall allow archival of video data to external network locations or NAS devices over a network connection. The archival schedule shall be either automatic at user-defined intervals or manually executed.
		20. The video management system shall allow an administrator to enable pruning of previously recorded video by removing P-frames and retaining I-frames only, after a specified duration of days.
		21. The video management system shall be available as a hardware server with capacity to record up to 96 cameras at up to 450 Mbps recording throughput (per recorder).
		22. The video management system shall be available as a software product that can be installed on COTS hardware.
		23. The server shall support semantic grouping and organization of cameras/devices into groups using “tags”.
		24. The system shall allow users to export video on request; exported video shall be stored locally on the server or on another network location selected by the administrator.
		25. The system shall support aggregation by a higher-level environment, allowing the IP video management system to belong to a confederation of servers.
		26. The VMS shall be accessible via a web browser with no software installed for live and playback functionality.
		27. Basic Analytic capabilities
			1. Motion – Receive motion detection events from cameras
			2. Alarm – Receive detection of physical alarms from cameras within the system, triggering an event
			3. Analytic – Detection of analytic events and edge analytic events from cameras, including those that are free of charge
		28. Advanced Analytics Suite
			1. Detection of Objects (People and Vehicles) from an enabled camera
			2. Configure notifications when objects are detected in zones
			3. Configure notifications when objects move the wrong way though zones
			4. Configure confidence thresholds for object classification within a scene

### SPECIFICATIONS / MINIMUM HARDWARE REQUIREMENTS

* + 1. Power 2 Servers **(Pelco VXP-P2 Models)**
			1. Processor: Intel® Xeon® Silver 4210
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC) or Server 2019
			3. OS Drive: 2x SSD 480 GB (RAID 1)
			4. RAM: 16 GB DDR4
			5. HDD:
				1. Maximum Storage: Up to 96 TB (7200 RPM SATA) (depending on model)
				2. RAID Level: RAID5 / RAID6 / JBOD (depending on model)
			6. Video
				1. Outputs: 4x Mini DisplayPort (DP++) 1.4
				2. Maximum Video Resolution Per Output Type

mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz (30-bit color)

* + - 1. Audio
				1. Outputs DisplayPort Audio
				2. Connector Types mDP Cable (out)
			2. iDRAC controller
				1. Dell iDRAC9 Basic
			3. USB Ports:
				1. USB 2.0 2x Front
				2. USB 3.0 2x Rear
			4. Networking:
				1. Gigabit Ethernet (1000Base-T) Ports 2x + dedicated iDRAC port
				2. Throughput Up to 450 Mbps
				3. IP version IPv4 and IPv6
			5. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			6. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply Dual Hot Swappable 750 W (Platinum)
				3. Consumption 2891 BTU/hr maximum
			7. Environmental:
				1. Temperature

Operating 10° to 35°C (50° to 95°F) with no direct sunlight

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 10% to 80% RH with 29°C (84.2°F) max. dew point
				2. Non-Operating Relative Humidity 5% to 95% RH with 33°C (91.4°F) max. dew point, non-condensing
				3. Operating Altitude Max. 3048 m (10,000 ft)
				4. Operating Vibration 0.26 Grms at 5 to 350 Hz (operation orientations)
			1. Physical
				1. Dimensions: 68.2 x 43.4 x 8.68 cm (26.8 x 17.1 x 3.4 in) without rack ears
				2. Rack Mounting 2 RU
				3. Unit Weight (varies by configuration) 29.68 kg (65.43 lb)
		1. Flex 2 Servers **(Pelco VXP-F2 Models)**
			1. Processor Intel Xeon E-2234
			2. Operating System Microsoft Windows 10 IoT Enterprise 64-bit (LTSB)
			3. OS Drive M.2 SSD 240 GB
			4. RAM 16 GB DDR4
			5. HDD
				1. Maximum Storage Up to 28 TB (7200 RPM SATA) (depending on model)
				2. RAID Level RAID5 / RAID6 / JBOD (depending on model)
			6. Video
				1. Outputs

4x Mini DisplayPort (DP++) 1.4

* + - * 1. System NVIDIA Quadro P620 (2 GB memory)
				2. Maximum Video Resolution Per Output Type

mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz (30-bit color)

* + - 1. Audio
				1. Outputs DisplayPort Audio
				2. Connector Types mDP Cable (Out)
			2. iDRAC Controller
				1. Dell iDRAC9 Basic
			3. USB Ports
				1. USB 2.0 4x rear
				2. USB 3.0 1x front, 2x rear
			4. Networking
				1. Gigabit Ethernet (1000Base-T) ports 2x + dedicated iDRAC port
				2. Throughput Up to 450 Mbps
				3. IP Version IPv4 and IPv6
			5. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			6. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply Internal 350 W (Bronze)
				3. Consumption 1405 BTU/hr maximum (350 W power supply)
			7. Environmental
				1. Temperature

Operating 10° to 35°C (50° to 95°F) with no direct sunlight

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 10% to 80% RH with 29°C (84.2°F) max. dew point
				2. Non-Operating Relative Humidity 5% to 95% RH with 33°C (91.4°F) max. dew point, non-condensing
				3. Operating Altitude Max. 3048 m (10,000 ft)
				4. Operating Vibration 0.26 Grms at 5 to 350 Hz (operation orientations)
			1. Physical
				1. Dimensions 58.91 x 21.8 x 44.33 cm (23.19 x 8.58 x 17.45 in)
				2. Unit Weight (varies by configuration) 25.25 kg (55.67 lb)
		1. Eco 2 Servers **(Pelco VXP-E2 Models)**
			1. Processor: Intel Xeon E-2124
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSB)
			3. OS Drive: M.2 SSD 240 GB
			4. RAM: 16 GB DDR4
			5. HDD:
				1. Maximum Storage Up to 12 TB (7200 RPM) (depending on model)
				2. RAID Level: JBOD
			6. Video
				1. Outputs

4x Mini DisplayPort (DP++) 1.4

* + - * 1. System NVIDIA Quadro P620 (2 GB memory)
				2. Maximum Video Resolution Per Output Type

mDP 1.4 direct connect 5120 x 2880 at 60 Hz (30-bit color)

* + - 1. Audio
				1. Outputs DisplayPort Audio
				2. Connector Types mDP Cable (Out)
			2. iDRAC Controller
				1. Dell iDRAC9 Basic
			3. USB Ports
				1. USB 2.0 4x rear
				2. USB 3.0 1x front, 2x rear
			4. Networking
				1. Gigabit Ethernet (1000Base-T) ports 2x + dedicated iDRAC port
				2. Throughput Up to 200 Mbps
				3. IP Version IPv4 and IPv6
			5. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			6. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply 365 W (Gold)
				3. Consumption 1908 BTU/hr maximum (365 W power supply)
			7. Environmental
				1. Temperature

Operating 10° to 35°C (50° to 95°F) with no direct sunlight

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 10% to 80% RH with 29°C (84.2°F) max. dew point
				2. Non-Operating Relative Humidity 5% to 95% RH with 33°C (91.4°F) max. dew point, non-condensing
				3. Operating Altitude Max. 3048 m (10,000 ft)
				4. Operating Vibration 0.26 Grms at 5 to 350 Hz (operation orientations)
			1. Physical
				1. Dimensions 45.38 x 17.5 x 36.29 cm (17.87 x 6.89 x 14.29 in)
				2. Unit Weight (varies by configuration) 11.16 kg (24.6 lb)
		1. Eco 3 Servers **(Pelco VXP-E3 Models)**
			1. Processor: Intel Core i5-9500
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC)
			3. OS Drive: M.2 NVMe 256 GB
			4. RAM: 16 GB DDR4
			5. HDD:
				1. Maximum Storage Up to 32 TB (7200 RPM SATA)
				2. RAID Level: JBOD
			6. Video
				1. Outputs

4x Mini DisplayPort (DP++) 1.4

* + - * 1. System NVIDIA Quadro P620 (2 GB memory)
				2. Maximum Video Resolution Per Output Type

mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz (30-bit color)

* + - 1. Audio
				1. Outputs DisplayPort Audio
				2. Connector Types mDP Cable (Out)
			2. USB Ports
				1. USB 3.0 2x front
				2. USB 3.1 Type-C 1x front, 2x rear
			3. Networking
				1. Gigabit Ethernet (1000Base-T) ports 1x 1 Gigabit Ethernet (1000 Base-T), 1x 10 Gigabit Ethernet (10 G Base-T)
				2. Throughput 250 Mbps
				3. IP Version IPv4 and IPv6
			4. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			5. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply Internal 550 W—1 included, 2 maximum
				3. Consumption 2107 BTU/hr maximum (550 W power supply)
			6. Environmental
				1. Temperature

Operating 10° to 35°C (50° to 95°F) at unit front air intake

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 10% to 85%, non-condensing
				2. Non-Operating Relative Humidity 10% to 90%, non-condensing
				3. Operating Altitude Max. 3048 m (10,000 ft)
				4. Operating Vibration 0.26 Grms
			1. Physical
				1. Dimensions 57.75 x 48.2 x 4.28 cm (22.73 x 18.97 x 1.68 in)
				2. Unit Weight (varies by configuration) 12.42 kg (27.38 lb)
		1. Desktop Workstations **(Pelco VX-WKST Models)**
			1. Processor: Intel Core™ i7-8700
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC)
			3. OS Drive: m.2 256 GB
			4. RAM: 16 GB DDR4
			5. Video
				1. Outputs:

4x Mini DisplayPort (DP++)

* + - * 1. System NVIDIA Quadro P620 (2 GB memory)
				2. Maximum Video Resolution Per Output Type
				3. mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz (30-bit color)
			1. Optical Drive DVD±RW
			2. Audio
				1. Inputs Universal Audio Jack (front)
				2. Outputs Universal Audio Jack (front), Line Out (rear), Internal Speaker, 4x Mini DisplayPort
				3. Connector Types 3.5 mm 4 pole (In/Out), 3.5 mm 3 pole (Out), mDP cable (Out)
			3. USB Ports
				1. USB 2.0 2x front, 2x rear
				2. USB 3.0 1x front, 4x rear
				3. USB 3.3 Type-C 1x front
			4. Networking
				1. Gigabit Ethernet (1000Base-T) ports 1x
				2. IP Version IPv4 and IPv6
			5. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			6. Power
				1. Input 90 to 264 VAC, 47 to 63 Hz, 3 A/1.5 A
				2. Supply Internal 180 W (Bronze)
				3. Consumption 614 BTU/hr maximum (180 W power supply)
			7. Environmental
				1. Temperature

Operating 0° to 35°C (32° to 95°F) with no direct sunlight

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 5% to 95%, non-condensing
				2. Non-Operating Relative Humidity 10% to 90%. non-condensing
				3. Operating Altitude 15.2 to 3048 m (-50 to 10,000 ft)
				4. Operating Vibration 0.66 Grms
			1. Physical
				1. Dimensions 29.0 x 29.2 x 9.26 cm (11.4 x 11.5 x 3.6 in)
				2. Unit Weight (varies by configuration) 5.14 kg (11.42 lb)
		1. Rackmount Workstations **(Pelco VX-RKWKST)**
			1. Processor: Intel Core i7-9700K
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC)
			3. RAM: 16 GB DDR4
			4. SSD Storage: 256 GB
			5. Video
				1. Graphics:

**VX-RKWKST**: NVIDIA Quadro P620 (1x)

* + - * 1. Memory: 2 GB GDDR5
				2. Outputs:

Mini DisplayPort (DP++) 1.4 (4x)

**Reference Pelco VX-RKWKST**

* + - * 1. Resolution Capability:

DisplayPort 3840 x 2160 @ 60 Hz

* + - 1. USB Ports:
				1. USB Type-A 3.1 Gen1 2x Front
				2. USB Type-C 3.1 Gen2 1x front, 2x Rear
				3. Networking Interface 1 Gigabit Ethernet (1000Base-T), 10 Gigabit Ethernet

(10GBase-T)

* + - * 1. IP version IPv4 and IPv6
			1. Power
				1. Input 100 to 240 VAC 50/60 Hz ±5%, autoranging
				2. Supply Internal
				3. Consumption 550 W, 7.4 A / 3.7 A (maximum)
			2. Environmental
				1. Operating Temperature 10° to 35°C (50° to 95°F) at unit air intake (front of unit)
				2. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				3. Operating Relative Humidity 10% to 85%, non-condensing
				4. Non-Operating Relative Humidity 10% to 90%, non-condensing
				5. Operating Vibration 0.26 GRMS
			3. Physical
				1. Dimensions 57.75 x 48.2 x 4.28 cm (22.73 x 18.97 x 1.68 in)
				2. Mounting 1 RU
				3. Unit Weight 12.42 kg (27.38 lb)
				4. Construction Steel and plastic cabinet

### CLIENT DESKTOP APPLICATION

* + 1. The Client application shall be Windows-based, providing an environment from which authorized users can watch live and recorded video on a computer in which the application has been installed.
			1. The Client application shall import users and roles from existing LDAP servers, and enable single sign-on (SSO).
		2. The Client shall consist of a main Mission Control panel, which may be hidden, working in unison with a series of windows (workspaces), each providing a tab-based experience.
		3. The Client application shall be capable of connecting to either unicast or multicast.
		4. The Client application shall be able to connect with multiple systems simultaneously.
		5. The Client application shall be able to support the ability to map standard commands to a QWERTY keyboard combination.
		6. Workspaces and Tabs
			1. The Client interface shall be based upon workspaces and tabs.
				1. A tab shall be a configurable layout populated with sources of content and plugins contained in cells.
				2. A tab shall support up to 64 cameras in a 8 x 8 layout.
				3. A collection of one or more tab windows shall constitute a workspace.
				4. The Client shall allow configuration and recall of complete workspaces.

An operator with appropriate permissions shall be able to send a saved workspace to other clients, causing their system to launch the saved workspace.

* + - * 1. Any layout of video can be saved as a tab to be later recalled by an operator.

Remote tab push: An operator with appropriate permissions shall be able to send a saved tab to other clients, causing their system to launch the saved tab.

* + - * 1. Video in cells shall have the capability for live view, playback search options, and export.
				2. Collaborative Tabs: an operator with appropriate permissions can view a designated collaborative tab so that multiple operators at different stations can see the exact same content and can make changes to live and playback video on this tab that other operators can see in real time.
				3. Shared Display Decoder: Client shall be capable of being designated as an independent Shared Display mode. In this mode:

The client will restart automatically if the machine reboots.

The client will log in with the Shared display account automatically.

The client will restore the last tab and content that was displayed prior to shut down.

The client will accept stream and tab pushes from any connected client with permissions.

The client will be configurable to hide header and footer information, as well as borders, so that only video is shown.

* + - * 1. Cells can be configured to show video without borders such that the video is stretched to cover the available space on the screen without black borders on any side.
				2. Cells can be configured to rotate the video stream 90, 180, -90, or -180 degrees.
		1. Live View and Playback
			1. A list of video and audio sources which users are authorized to access shall be displayed.
			2. Each video source shall indicate a list of current viewers to a user with appropriate permissions.
			3. Each video source that is being viewed shall display whether there are current alarms associated with the source.
			4. The client shall indicate when there has been a reduction in video quality for the displayed video sources.
			5. The client computer shall be able to connect to an unrestricted number of recorders simultaneously to display live and recorded video.
			6. The client shall allow video streams to be selectable from a system tree which can be built by users with appropriate permissions.
			7. The client shall playback audio associated with video sources for users with the correct permissions.
			8. Users shall be able to seamlessly switch between live and recorded video on the fly.
			9. Live View
				1. For live view, cells will be displayed at the highest quality possible, based on the bandwidth and client hardware. The Client application will use the primary stream from a video source as the default; if the bandwidth or client hardware are approaching the limit, the video quality of as many streams as necessary will then be streamed as secondary or at MJPEG quality.
				2. Cells 1/4 the size of the tab or larger shall display the primary stream, and cells smaller than 1/4 the size of the tab shall display the secondary stream to conserve bandwidth and processing power.
			10. Bookmark
				1. The Client shall allow operators to bookmark video

The operator shall be able to specify the name & description of the bookmark.

The operator shall be able to lock video and audio around the bookmark and set the time range for the bookmark.

* + - * 1. The Client shall allow operators to search bookmarks by name, description, or time range.
			1. Pan Tilt Zoom (PTZ)
				1. Digital Zoom - An operator shall be able to digitally zoom in a video stream in live or playback mode.
				2. Optical Zoom and Pan Tilt Control: Operators shall be able to control PTZ cameras.
				3. The Client application shall be able to perform digital de-warping of Optera and Evo 180-, 270-, and 360-degree cameras.
			2. Playback
				1. The Client application shall enable synchronized playback of up to nine (9) streams simultaneously in one tab.
				2. The Client application shall have the capability to playback several non-synchronized cameras at one time in different cells.
				3. For viewing recorded video, cells 1/4 the size of the tab or larger shall display full-frame rate video, and cells smaller than 1/4 the size of the tab shall playback only I-Frames to conserve bandwidth and processing power.
				4. When hovering over a recorded video time bar, an operator shall see a thumbnail representing the contents of the video stream at that point in time.
				5. Available playback control functions:

date-time selection

synchronized playback of selected cells within a tab

play video at normal speed

pause video and advance one frame

pause video and rewind 0.5 second

fast forward video at speeds up to 128x

rewind video at speeds up to 128x

jump video forward or back in preset increments and initiates playback

forward video to live playback

take snapshot of the current frame

* + - * 1. Hovering over a video playback cell with a mouse shall display the playback control menu.
			1. The user shall be able to configure a rotating sequence of cameras, allowing the application to cycle through cameras relevant to the operator without intervention.
				1. Using keyboard input alone, the operator can type a camera number, a preset number, or a time (hhmm format) to jump to a selected camera. No mouse input is necessary.
				2. Users shall be able to create keyboard shortcuts to trigger predefined video management system actions.
			2. The user shall be able to create a sequence of cameras by dragging and dropping camera names in a single user interface.
				1. The user shall be able to configure a rotating sequence of cameras, allowing the application to cycle through cameras relevant to the operator without intervention.
				2. The user shall be able to configure a sequence of cameras that appear on alarm, allowing the application to cycle cameras when an event or alarm relevant to the user occurs.
		1. Investigations
			1. An investigation mode shall be available to provide multiple layouts (1x1, 2x2, and 3x3) with synchronized playback controls, allowing users to fully investigate a scene from multiple angles.
			2. The investigation mode shall display recording types for motion, analytics, and alarms in recorded video.
			3. The investigation mode shall enable operators to synchronize video playback and export investigative playlists covering scenes of interest in forward or reverse at speeds up to 128 times normal playback.
			4. Users shall be able to create playlists from multiple video clips encompassing selected scenes from an investigation. Audio shall be included any time it is associated with a video clip.
			5. Operators shall be able to save an investigation, preserving the associated device list and any created clips for later recall.
				1. Saved investigations shall be capable of being shared with other operators.
			6. Operators shall be able to export individual video clips or entire playlists.
			7. Administrators can configure the system to save exports to a shared network drive for evidentiary safe-keeping and quick access.
			8. Investigation mode shall allow video clips from cameras of interest to be clipped to shorter times to allow for smaller video exports.
			9. Investigation mode shall be a built-in application, provided at no additional cost.
			10. Investigation mode shall have the ability to create multiple clips, allowing views from any camera to be added to an exported playlist.
		2. Export
			1. The Client shall allow a user to preview the export playlist prior to creating the finished export.
			2. The Client shall initiate an export on the server independent of the client workstation; allowing the user to log off or use their workstation for other tasks.
			3. An operator shall be able to create a JPEG or PNG snapshot image of the current frame of video in a cell. The user shall be able to include the camera name and timestamp in the snapshot.
			4. An operator shall be able to select encryption of exports prior to the export, and the export shall be protected by the user-entered password.
			5. The system shall save the export and permit the operator to download the export to any system-accessible media including locally to HDD, CD/DVD, Flash USB device, or to network storage.
		3. Display
			1. The Client application shall allow at least four (4) 1080p resolution streams per monitor and support 60 fps camera streams per monitor.
		4. Events
			1. The Client application shall enable an operator to respond to events.
			2. The Administrator shall specify which Clients shall receive notifications by user role.
			3. Certain events shall be configurable for acknowledgement.
				1. Acknowledgement options:

snoozed

in process

acknowledged

* + 1. Relays – For devices that have a physical relay that is enabled on the VMS System, the Client application shall enable operators to activate or deactivate relays.
		2. Plugins – The Client application shall support an open interface that facilitates the creation and deployment of user interface plugins including, but not limited to, mapping, video information overlays, access control, license plate recognition, and video content analysis with the option to integrate other third-party applications (such as advanced GIS Mapping Interfaces).
		3. System and Device Information
			1. Information management
				1. The Client application shall provide a mechanism to create and assign metadata to devices.
				2. A primary device list shall be apparent in the Client application, and devices shall be assignable to folders.

The device list shall be sortable by device name or device number.

The device list shall be able to be filtered by the following terms:

simple text-based filter, matching the device name or device number

tag-based filtering, showing devices matching the intersection of all assigned tags

status-based filtering, showing devices with a particular status

* + - 1. User Roles, as assigned by a System Administrator, shall define the limits of a user’s ability to access live or recorded video and to export video and other standard client operations.
				1. Authorized users shall be able to share views, including window arrangements and camera selections, with other users, for purposes of collaboration.
			2. When using a mouse to hover over a device in a listing, a popup shall appear with the following information:
				1. Device name
				2. Thumbnail image
				3. Device state
				4. Associated tags
				5. IP Address
		1. Client Specifications – See Specifications / Minimum System Requirements **VXP-WKST** **and** **VX-RKWKST, above**.

### INTEGRATIONS

* + 1. Plugins shall be able to be created by third-party developers using a vendor-provided API that is a RESTful open-standard architecture to communicate with the VMS system.
		2. Plugins shall be built using programming languages that can make HTTP requests and parse JSON responses.
		3. API clients shall interact with VMS using the HTTP methods of GET, POST, PATCH, PUT, and DELETE.

### EXPORT PLAYER

* + 1. The Client shall distribute a standalone application for export playback.
		2. The Client shall be optionally included with downloaded exports.
		3. The Client shall provide tamper validation via a check sum.
		4. The Client shall provide a means to playback exported video and audio in two methods.
			1. Sequentially – play video and audio in the order arranged in the export playlist.
			2. 4-Up – plays 4 simultaneous streams of video and audio in a time synchronized manner, from the export playlist.
		5. The Client shall provide de-warping and Immersive PTZ for Optera and Evo cameras.

### CLIENT WEB APPLICATION

* + 1. The Client application shall be browser-based, providing an environment from which authorized users can watch live and recorded video on a computer in which has access to the system.
		2. The Client shall consist of a main Mission Control panel, working in unison with a series of tabs.
		3. Tabs
			1. A tab shall be a configurable layout populated with sources of content contained in cells.
			2. Video in Cells shall have the capability for, live view, playback, and export.
		4. Live View and Playback
			1. A list of video and audio sources which users are authorized to access shall be displayed.
			2. Each video source that is being viewed shall display whether there are current alarms associated with the source.
			3. The client computer shall be able to connect to an unrestricted number of recorders simultaneously to display live and recorded video.
			4. The client shall allow video streams to be selectable from a system tree which can be built by users with appropriate permissions.
			5. Users shall be able to seamlessly switch between live and recorded video on the fly.
			6. Video Quality
				1. Motion JPEG can be used for video streaming.
				2. H.264 can be used for video streaming.
			7. Bookmark
				1. The Client shall allow operators to bookmark video

The operator shall be able to specify the name & description of the bookmark.

The operator shall be able to lock video and audio around bookmark and set the time range for the bookmark.

* + - * 1. The Client shall allow operators to search bookmarks by name, description, or time range.
			1. Pan Tilt Zoom (PTZ)
				1. Digital Zoom - An operator shall be able to digitally zoom in a video stream in live or playback mode.
				2. Optical Zoom and Pan Tilt Control: Operators shall be able to control PTZ cameras.
				3. The Client application shall be able to perform digital de-warping of Optera 180-, 270-, and 360-degree cameras.
			2. Playback
				1. The Client application shall have the capability to playback non-synchronized cameras at one time in different cells.
				2. Available playback control functions:

date-time selection

play video at normal speed

fast forward video at speeds up to 128x

rewind video at speeds up to 128x

forward video to live playback

take snapshot of the current frame

* + - * 1. Hovering over a video playback cell with a mouse shall display the playback control menu.
			1. Using keyboard input alone, the operator can type a camera number, a preset number, or a time (hhmm format) to jump to a selected camera. No mouse input is necessary.
		1. Export
			1. The Client shall allow a user to create quick export in one- or five-minute increments.
			2. The Client shall initiate an export on the server independent of the client workstation; allowing the user to log off or use their workstation for other tasks.
			3. An operator shall be able to create a JPEG snapshot image of the current frame of video in a cell.
			4. An operator shall be able to select encryption of exports prior to the export, and the export shall be protected by the user-entered password.
			5. The system shall save the export and permit the operator to download the export to any system-accessible media including locally to HDD, CD/DVD, Flash USB device, or to network storage.
		2. Events
			1. The Client application shall enable an operator to respond to events.
			2. The Administrator shall specify which Clients shall receive notifications by user role.
			3. Certain events shall be configurable for acknowledgement.
				1. Acknowledgement options:

snoozed

in process

acknowledged

* + 1. Relays – For devices that have a physical relay that is enabled on the VMS System, the Client application shall enable operators to activate or deactivate relays.
		2. System and Device Information
			1. Information management
				1. The Client application shall provide a mechanism to create and assign metadata to devices.
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* + - 1. User Roles, as assigned by a System Administrator, shall define the limits of a user’s ability to access live or recorded video and to export video and other standard client operations.
				1. Authorized users shall be able to share views, including window arrangements and camera selections, with other users, for purposes of collaboration.
			2. When using a mouse to click on a device in a listing, a popup shall appear with the following information:
				1. Device name
				2. Thumbnail image
				3. Device state
				4. Associated tags
				5. IP address

### 3D MOUSE CONTROLLER

* + 1. The 3D Mouse shall be compatible with all distributed network video management components.
		2. Patented six-degrees-of-freedom (6DoF) sensor to precisely navigate digital models or camera positions in 3D space.
		3. Advanced ergonomic design – The full-size, soft-coated hand rest shall position the hand comfortably, and 15 large, soft-touch, function keys allow quick access to frequently used commands.
		4. QuickView Keys – Fingertip access to 12 views facilitating switch cameras.
		5. Intelligent Function Keys –Access to 4 application commands for an optimized workflow.
		6. On-Screen Display – Provides a visual reminder of function key assignments on your computer screen.
		7. 3D Space Mouse Modifiers – Fingertip access to Ctrl, Shift, Alt and Esc keys saves time by reducing the need to move your hand between mouse and 3D Mouse.
		8. Virtual NumPad – Allows direct numerical input into your application using your standard mouse rather than the 3D Mouse.
		9. The 3D Mouse shall be part of an integrated system and shall be configured so any number can be added to the system. When combined with user interfaces (UIs), network storage managers (NSMs), encoders, IP cameras, and video consoles, the 3D Mouse forms an integral part of a complete network-based video control system.
		10. Hardware
			1. Power Supply
				1. Input Connector Type Universal, interchangeable
			2. Connectivity
				1. 3D Space Mouse Interface USB 2.0
				2. Cable USB
			3. Module Specifications
				1. 3D Space Mouse Keypad
				2. Joystick Fully proportional PTZ, variable speed; with zoom, iris, and focus controls
			4. Physical
				1. Dimensions 204 x 142 x 58 cm (8.0" D x 5.6" W x 2.3" H)
				2. Unit Weight 665 g (1.47 lbs)
			5. Environmental
				1. Operating Temperature 0° to 40°C (32° to 104°F) air intake of unit
				2. Storage Temperature –40° to 65°C (–40° to 149°F)

### KEYBOARD

* + 1. The VMS shall provide keyboard functionality.
		2. The keyboard shall also:
			1. be compatible with all distributed network video management systems.
			2. support USB 2.0 protocol, operating at full speed.
		3. System Requirements
			1. Windows Vista, Windows 7, Windows 8 / 8.1, or Windows 10
			2. Two (2) USB ports
			3. 70 MB of available hard disk space

### CYBERSECURITY

* + 1. The VMS server application user interface shall support the following:
			1. client authentication
			2. TLS-based encryption over HTTPS
			3. configurable roles and permissions
			4. retrieval of logs and reports of user actions
		2. System software shall be able to operate without conflict alongside antivirus software.
		3. System servers shall not store passwords in an unencrypted format.
		4. System shall enforce the changing of default passwords upon initial use of the system.
		5. System shall support encrypting exports.
		6. The VMS Accessory Server shall support HTTPS when acting as a proxy load balancer for the VMS core server.
		7. The VMS server components shall support synchronized system clocks using NTP.
		8. The system shall support functionality with FIPS-validated cryptographic modules and DISA-STIGs applied.
		9. The system shall support RMF-compliant configurations (FISMA/NIST).

END OF SECTION

1. **EXECUTION**

### INSTALLERS

* + 1. Contractor personnel shall comply with all applicable state and local licensing requirements.

### PREPARATION

* + 1. The network design and configuration shall be verified for compatibility and performance with the camera(s).
		2. Network configuration shall be tested and qualified by the Contractor prior to system installation.

### INSTALLATION

* + 1. Contractor shall follow all manufacturer published installation and configuration instructions and guidelines.

### STORAGE

* + 1. Server hardware shall be stored in an environment where temperature and humidity are in the range specified by the Manufacturer.

END OF SECTION