

**CompleteView Enterprise**

Video Management System

Architectural and Engineering Specifications

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**Product Guide Specification**

**Specifier Notes:** This product guide specification is written according to Construction Specifications Institute (CSI) *section guidance* found in the *MasterFormat*, *SectionFormat* and *PageFormat* publications*. By removing the references to specific Salient product names or part numbers, the specifications text may also be used also in performance-based specifications.*

The section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project and local building code. *Italicized Words and sentences within brackets [ ] are choices to include or exclude a particular item or statement.* Delete the Specifier Notes in red in the Section body of this document. Coordinate this section with other specification sections and the Drawings.

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1. Section

Video Management System

* + 1. GENERAL
  1. SUMMARY
     + - 1. *Description:* This is a product specification for a networked video management system.

This specification is written as from the Owner to the product Manufacturer, unless otherwise stated.

The terms Contractor and Installer are used interchangeably in this document.

* + - * 1. Section Includes:

Description of architecture and functionality for a security video surveillance control and management system, or video management system (VMS) or just “system” for short.

Manufacturer’s system design criteria.

Design requirements for performance, functionality, and system characteristics that the system must meet.

Detailed specifications for the system server and client software.

Manufacturer and installer qualification requirements.

* + - * 1. Related Sections:

**Specifier Note:** Include a short description after the section number and title below, that states what is in the “related section” that is specifically related to this VMS project. Delete any section listed below if it does not have content specifically intended for this project.

1. Section 27 00 00 Communications (Division 27).
2. Section 27 15 01 – Conductors and cables for electronic safety and security.
3. Section 28 05 13 – Servers, Workstations and Storage for Electronic Safety and Security.
4. Section 28 05 21 – Network Attached Storage for Electronic Safety and Security.
5. Section 28 05 31 – Communications Equipment for Electronic Safety and Security.
6. Section 28 05 33 – Safety and Security Network Communications Equipment.
7. Section 28 20 00 – Access Control for video surveillance.
8. Section 28 21 00 – Surveillance Cameras.
   1. REFERENCES
      * + 1. Trademarks used in this document:
9. Microsoft: Microsoft®, Windows®, Active Directory®.
   * + - 1. Abbreviations and Acronyms:
10. *API:* Application Programming Interface.
11. *CFR:* Code of Federal Regulations.
12. *DAS:* Direct Attached Storage.
13. *DVR:* Digital Video Recorder.
14. *FCC:* Federal Communications Commission.
15. *FPS:* Frames per Second.
16. *H.264/H.265:* Video compression formats.
17. *HTML:* Hyper Text Markup Language.
18. *HTTPS:* Hyper Text Transfer Protocol Secure.
19. *iSCSI:* Internet Small Computer Systems Interface.
20. *I/O:* Input/Output.
21. *IP:* Internet Protocol.
22. *JPEG:* Joint Photographic Experts Group (image format).
23. *MPEG:* Moving Picture Experts Group (video format).
24. *NAS:* Network Attached Storage.
25. *NTSC:* National Television System Committee (a standards body).
26. *NVR:* Network Video Recorder.
27. *ONVIF:* Open Network Video Interface Forum.
28. *PTZ:* Pan-Tilt-Zoom.
29. *SAN:* Storage Area Network.
30. *UPnP:* Universal Plug and Play.
31. *VMS:* Video Management System.
    * + - 1. Definitions:
32. *Contractor:* Firm selected by Owner, and any of Contractor’s subcontractors, vendors, suppliers or fabricators, to perform the installation, commissioning and maintenance work related to the VMS that is the subject of this specification.
33. *Open Platform:* A software platform which is based on open standards, such as published and fully documented external application programming interfaces (API) that allow using the software to function in other ways than the original programmer intended, without requiring modification of the software application's source code. This allows the development of interfaces with systems and devices by other manufacturers that extent the functionality of the original VMS. It also involves the use of open standards, such as ONVIF for video devices, that enable new devices to be compatible with an existing VMS deployment without the need to make changes to the VMS software.
34. *Open Architecture:* As used in this specification, open architecture refers to a type of software architecture that provides users (or their technology service technicians) access to all or parts of the architecture without any proprietary constraints.This means that the system may be flexibly deployed in countless variations of single-server and multi-server architectures across any number of sites, without any special action required by the manufacturer. Use any cameras, use any suitable hardware or virtual machines, use whichever client software works for a user – desktop, web or mobile.
35. *REST:* A widely-adopted software industry standard for how different software systems can exchange information securely across a network or the Internet. A RESTful API is an application programming interface that conforms to the REST principles.
    1. SUBMITTAL
       * + 1. Product Data:
36. Manufacture’s data sheets, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for a complete VMS.
    * + - 1. Shop Drawings:
37. System device locations on architectural floor plans.
38. Full schematic of system including wiring information for all devices.
    * + - 1. Closeout Submittals:
39. User manuals.
40. Parts list.
41. System device locations on architectural floor plans.
42. Wiring and connection diagrams.
43. Maintenance requirements.
    1. QUALITY ASSURANCE
       * + 1. Manufacturer Qualifications:
44. *Experience:* Have a minimum of ten years of experience in the manufacture and design of VMS products for commercial or industrial use.
45. *Training:* Provide online, self-paced training for installers, system administrators and users. Online training shall be accessible from manufacturer’s website at any time.
46. *Installer Support:* Provide factory direct technical support to the installing firm.
    * + - 1. Installer Qualifications:
47. *Experience:* Have a minimum of five years’ experience installing VMS products.
48. *Trained Technicians:* All installation, configuration, setup, programming and related work shall be performed by technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.
49. *References:* Contractor shall provide four current project references from customers with systems of similar scope and complexity which became operational in the past five years.

At least three references shall be utilizing the same system components, in a similar configuration as the proposed system.

References shall include a current point of contact, company or agency name, business address, telephone number, and if the contact agrees, include a basic system description and date of project completion. The owner reserves the option to visit the reference sites, with the site owner’s permission and representative, to verify the quality of installation and the reference’s level of satisfaction with the system.

1. *Dealer Certification:* Provide evidence that installing service company is an authorized dealer in good standing for the product’s manufacturer, and that installing service company meets the manufacturer’s technical certification requirements.
   * + - 1. Code Requirements:

*Installation Codes and Standards:* System shall be installed in accordance with all applicable national, state, provincial, regional and local codes and standards.

*Equipment Requirements:* All equipment shall be U.L. listed or meet U.L. requirements for its intended use.

* 1. DELIVERY, STORAGE, AND HANDLING
     + - 1. *Delivery:* Deliver materials in manufacturer’s original, unopened, undamaged containers with original identification labels.
         2. *Storage:* Protect stored materials from environmental and temperature conditions following the manufacturer’s instructions.
         3. *Handling:* Handle and operate products and systems according to the manufacturer’s instructions.
  2. SITE CONDITIONS
     + - 1. Ambient Conditions:

[SPECIFIER NOTE: Identify site specific ambient conditions under which work must be performed such as bad lighting, obstacles, or extreme cold/heat that installers or equipment may have to deal with. Delete this paragraph if not needed.]

* + - * 1. Existing Conditions:

[SPECIFIER NOTE: Identify site specific existing conditions. Such as the condition of existing work subject to reworking or modification. Delete if not needed.]

* 1. WARRANTY
     + - 1. *Manufacturer’s Warranty and Support:* <https://support.salientsys.com/knowledgebase/warranties/#1643746113986-1d0fa2ad-a476>)

*Initial Software Warranty:* For a period of one year, software shall substantially conform to Manufacturer’s then-current functional specifications for the software, as set forth in the applicable documentation, provided that the software is properly installed on approved hardware and operated as contemplated in its documentation. Manufacturer’s sole obligation and Customer’s sole remedy for any failure of the software is limited to the repair or replacement of the software at Manufacturer’s discretion.

*Warranty Extension:* Provide a means to extend initial software warranty beyond the first year, without the need to upgrade to a new version of the product.

*Software Updates:*

For the life of the software product, provide free access to any software updates or hot fixes released due to a material defect or error in the product.

Provide additional years of software upgrades available for purchase separately.

*Initial Hardware Warranty:* For a period of one year, hardware shall substantially conform to hardware’s then-current functional specifications for the hardware, if a defect in material or workmanship occurs and a valid claim is received within the warranty period. Manufacturer shall either repair the product at no charge, using new or refurbished replacement parts, or exchange the product with a new or refurbished product at Manufacturer’s option.

*Product Availability:* Manufacturer shall, for the life of the product, make available ordering of new product and/or additional licensing for expansions, replacements and spare parts.

*Online Tech Support:* Manufacturer shall provide quick access to online tech support modules that cover the most frequently asked product questions at: <https://support.salientsys.com/>.

*Training:* Offer both online and classroom training.

*Online Certification:* Provide online interactive training modules with certification valid for one year.

*Classroom Certification:* Provide an instructor led 2-day course, held in a regional classroom setting, designed to provide certification on Manufacturer’s video management software, with certification is valid for two years.

*Remote Certification:* Provide instructor directed 2-day course, that students access through their own computer, designed to provide certification on Manufacturer’s video management software, with certification is valid for two years.

*Training Information:* Please visit the Manufacturer’s website to see the training calendar, agenda, and registration.

* + - * 1. *Contractor’s Warranty:* Fully warrant parts, materials and labor for a minimum of one year from date of the final acceptance of the VMS, including wiring, software, hardware and third-party products, including provision of all new software service releases during the Manufacturer’s warranty period.
  1. MAINTENANCE AND SERVICE
     + - 1. General Requirements:

*Service Calls:* Owner shall initiate service calls whenever system is not functioning properly.

*Personnel:* Service personnel shall be certified in the maintenance and repair of the selected type of equipment and integrations, and qualified to accomplish all work promptly and satisfactorily.

*Hours of Work:* Work shall be performed during regular workweek working hours, as determined by the deployment facility’s locale, excluding federal/public holidays, and any written Customer instructions.

*Impact of Work Performance:* Minimize impacts on facility operations when performing scheduled adjustments or other non-scheduled work.

*Verification of Operation:* As part of scheduled adjustments and repairs, verify operation of system as demonstrated by performance verification testing.

* + 1. PRODUCTS
       1. MANUFACTURER
          1. Acceptable Manufacturer:

1. *Company:* Salient Systems.
2. *Address:* 4616 W. Howard Ln., Building 1, Suite 100, Austin, TX 78728.
3. Office Telephone: 512-617-4800.
4. *Fax:* 512-617-4801
5. *Website:* www.salientsys.com
   * + - 1. Manufacturer’s Product Documents:

*User Manual:* [CompleteView-Manual-v7.1.1.pdf](https://support.salientsys.com/download/cv-v7-1-1-documentation/).

*Hardening Guide:* [Salient Systems Hardening Guide - ver 2 -SU.pdf](https://support.salientsys.com/download/hardening-guide/)

* + - * 1. *Substitutions:* Under the provisions of Division 1.

1. All proposed substitutions must be approved by the Consultant or Architect/Engineer professional.
2. Proposed substitutions must provide a line-by-line specification compliance document.
   * + 1. VIDEO MANAGEMENT SYSTEM
          1. *Description:* Client-server based networkable video management system (VMS) solution running under a Microsoft Windows operating system on a physical or virtualized compute platform, utilizing Manufacturer’s proprietary software and commercial off-the-shelf computer hardware.

*Purpose-Built Design:* The VMS system has a purpose-built open-architecture design for the capture, processing, storage and retrieval of unlimited amounts of analog and/or digital video with optional audio data from an unlimited number of cameras, as well as alarm event and other surveillance related data from associated systems such as access control, intrusion detection, and security surveillance video analytics. Support a wide range of deployments including new, all-IP camera environments as well as existing analog cameras, cabling and other security and IT infrastructure where appropriate to maximize existing Customer investments.

*Hybrid System.* System is a hybrid VMS whose hardware and software are capable of handling video streams from security surveillance analog and digital (IP) cameras.

* + - * 1. *Software Components:* The core VMS application software is composed of two server and one client applications. The server components run under a Microsoft Windows server operating system. The client component runs under a Microsoft Windows server desktop operating system. Additional cloud-based enhanced functionality is under development, some of which has been released for the current version of the VMS.

*Core Components:* The core components of the VMS include one Management Server, one or more Recording Servers and one or more Desktop Clients. Components shall interact with one another through system service calls and by listening to system events. All other components, servers and clients will be built based on these core components. See Figure 1 below.

*Management Server:* Acts as a central repository of all management data related to the VMS. There is only one Management Server per deployment regardless of the number of sites.

*Recording Server:* Responsible for all VMS functionalities and services.

*Desktop Client:* User facing application that runs under a Microsoft Windows desktop operating system for both administering and monitoring the VMS.

* 1. Figure 1. VMS Core Components.

Diagram

Description automatically generated

*Web Client and Mobile Device Clients:* The VMS software includes optional web client and mobile device client software for remote access to the VMS for users authorized for remote access.

*Web Client:* Enables viewing, playback, investigation and exporting of video streams associated with Recording Servers via a supported browser and Internet connections to the Management Server and one or more Recording Servers whose video will be accessed. Supported browsers and operating systems include:

Windows 10.

MacOS 10.11.

Firefox 68.

Chrome 81.

Edge 81.

*Mobile Client:* Mobile device software available in versions for Android, iPhone and iPad mobile devices, for remotely accessing VMS functionality.

*Salient Cloud Services:* Through the VMS connectivity is provided to the Salient Cloud Services application to enable wide remote access for monitoring VMS system health and utilizing other planned enhancements for centralized cloud-based access to on-premises VMS capabilities.

* + - 1. SYSTEM DESIGN CRITERIA
         1. *Scalable Architecture:* The software shall allow central management of an unlimited number of cameras, sites, and users. In addition, remote management via the cloud shall allow scalability of operations to meet changing deployment demands.

*Server Hardware Requirements:* Provide a Design Tool Wizard for system designers to use to determine the server hardware specification requirements for specific deployments.

* + - * 1. *Scalable Video Storage:*

*Storage Infrastructure:* For flexibility and scalability in video retention, provide scalable storage pools for Regular, Archive, Backup and Overflow storage that can utilize local storage as well as the types of storage available in commonly found business information systems and data center infrastructure. Include the ability to implement synchronous backup and overflow protection.

*Storage Analytics:* In response to increasing camera megapixel resolution and its impact on video storage requirements, facilitate effective storage management by providing utilization data, forecasting using continuous retention monitoring and predictive analytics. Provide instantly insightful visual depictions of storage status.

* + - * 1. *Video Support:*

*Hybrid Video Support:* Support the receipt of analog cameras connected to Recording Severs via digital encoders, and digital camera video streams along with camera metadata such as motion detection and other event data.

*ONVIF Compliance:* Support the ONVIF standard profile S mandatory compliance items for a VMS.

*Per-Camera Configuration Settings:* Support per-camera or grouped-camera configuration for:

Time zone setting.

Recording schedules.

Motion and alarm recording trigger configuration.

Video storage locations.

Minimum and maximum video retention settings.

Video retention analytics.

* + - * 1. *Availability and High Performance:* Provide the following capabilities to ensure high VMS availability and optimal performance.

*Parallel Processing:* Utilize a high performance, multi-threaded, application engine, to enable multiple tasks to be executed simultaneously to take full advantage of multiple core and multi-processor technology.

*Consistent Performance:* Simultaneously handle recording, archiving, retrieving, playback and live distribution of video and audio without performance degradation due to performing such operations simultaneously.

*Broad Network Support:* Make live and archived video/audio data available to authorized users at any time over any secure local or wide area networks made available to the VMS.

*Future Ready Camera Support:* Utilize a camera abstraction layer to capture video in such a way as to provide seamless support of multiple, disparate video source technologies, in a manner transparent to the user and facilitating the integration of new capture technologies as they become available without the need for VMS software revisions.

*IP-Based Camera Video Stream Support:* Provide direct support of IP-based video sources in such a way that the use of the camera manufacturer’s supplied special interface software, such as an ActiveX control, is not required.

*Instant Multi-Camera Evidence Capture:* Provide a feature that enables a user to quickly toggle on and off the recording in a series of cameras being focused on in live viewing, to facilitate gathering evidence when tracking a suspect across multiple cameras.

*Continuous Server Operation:*

Server software shall execute as a Windows “system service” so that full VMS functionality is maintained even if a Windows user is not logged into the operating system.

Servers shall maintain their full VMS functionality regardless of the user rights of a locally logged-on Windows user.

A locally logged-on Windows user with less than administrative rights shall not have the ability to stop, start or otherwise control the running state of the VMS Server.

A Windows user with administrative rights shall be able to control access to Windows applications, application settings, operating system settings and other functions without compromising VMS functionality.

*Robust Video Recording:* To enable high-speed video search and review of recorded video and reduce the potential of video/audio data corruption, video and audio data shall be stored outside of a database in a flat file structure within the Windows NTFS file system. Only the metadata of each video segment shall be stored in a database.

*Client-Server Architecture:* The system shall operate using a “Client/Server” architecture with no central video streaming server required.

*Third-Party Backup Tool Compatibility:* The system shall be compatible with commonly used IT backup software and not require a proprietary “archiving” function for management of stored video files. Compatible IT backup software shall include these features:

Locked file support.

Ability to duplicate files and folders.

Backup without encryption and compression.

Delete original files after backup.

*System Video Archiving Functionality:* The system shall include a built-in archiving feature for the purpose of moving recordings from their original storage location to a different local or network-attached storage pool on an administrator-defined schedule. The archiving feature shall be capable of separately archiving video marked as motion recordings, external alarm recordings and scheduled recordings or any combination of those types.

*Synchronous Video Data Backups:* The system shall be able to perform synchronous video backups of recorded video, meaning that the video is being written to Regular Storage and Backup Storage in parallel at the same time.

*Unconstrained Scalability:* There shall be no software-imposed limit on the scalability of the system, which shall be expandable by adding additional Recording Servers and associated storage devices. A single Management Server shall have the capacity to manage tens of thousands of cameras, and any number of users and user client software instances, when sized according to the Manufacturer’s Design Tool Wizard.

* + - * 1. *Systems Integration:* Provide an Open API for integrations with other security related systems such as for Access Control, Building and Perimeter Intrusion Detection, Central Station Monitoring and Video Analytics.
      1. RECORDING SERVER
         1. *Recording Server:* The VMS Recording Server component shall have the following characteristics and features.

1. *Coax-Connected Analog Cameras:* Support up to 64 directly connected analog cameras per Recording Server via an encoder card.
2. *Network-Connected Cameras:* Support an unlimited number of IP cameras or IP-encoded analog camera streams, constrained only by the capabilities of the Recording Server hardware.
3. *Maximum Camera Video Resolution:* Support up to 32 mega-pixel resolution per camera sensor.
4. *Maximum Recording Rate:* Record video at up to 30 Frames Per Second (FPS).
5. *Video Compression:* Support MJPEG, Microsoft MPEG-4, ISO MPEG-4, H.264 and H.265 compressions.
6. *Recorded Video Formats:* Record native camera format or transcode video to any supported format.
7. *Tamper-Evident Recordings:* Make recorded video tamper-evident by applying recognized, industry standard electronic watermarking.
8. The VMS manufacturer shall allow for third-party integration through the implementation of an application programming interface (API). The API shall grant internal or third-party developers the ability to add the following video functionality to their applications without the need for VMS client software to be installed or otherwise invoked:
9. Display live camera views.
10. Perform video archive search and retrieval functions.
11. Control pan-tilt-zoom cameras.
12. Add/Modify/Delete user accounts.
13. Initiate recording of external alarm events.
14. Modify a subset of the server configuration.
    * + - 1. *Recording Server Configuration:* Configuration of VMS Recording Servers and VMS client users shall be performed in the Configure module of the Desktop Client. The Desktop client application may be run from any network connected workstation and used to perform configuration of multiple Recording Servers individually or simultaneously.
15. *Configuration Options:* All configuration options shall be menu driven and provide control of functions such as Add server/client configuration; Edit server/client information; Delete server/client configuration; Backup / Restore client configuration; Users; View layouts, etc.
16. *Elimination of Redundant Data Entry:* To reduce redundant configuration data entry, administrators shall be able to clone:
17. Users and/or groups.
18. IP camera configurations.
19. Recording schedules.
20. *Camera Tree View:* Provide a tree-view of all configured cameras in the system. Rolling over the camera shall produce a live view. Selecting the camera displays the primary camera configuration information.
21. *Server Configuration:* Provide configuration for the following server information:
22. Server name; TCP port numbers used for client/server communication; Embedded Web server enable and HTTP port, etc.
23. Shall Import Active Directory and Lightweight Directory Access Protocol (AD/LDAP) users and groups.
24. Which events are to be kept in server logs.
25. E-mail configuration information for camera alarm notifications.
26. Administration of Feature Keys associated with the system.
27. *User Group Configuration:* Support an unlimited number of Users/Groups. Controls shall include:
28. *AD/LDAP Integration:* AD/LDAP shall be supported to allow importing of users groups existing elsewhere on the network.
29. *Group and User Administration: Enable a*dministration of both groups and users including viewing/modifying server configuration; logging of events such as login, logout, playback requests, live view requests, etc.
30. *Password Controls:* Enable configurable password expiry and complexity rules for VMS users.
31. *User Camera Permissions:* Include user camera permissions to enable view, enable playback (with or without export capability), enable Snapshot, enable PTZ control, number of presets allowed per camera and PTZ priority.
32. *Setting PTZ Priority:* PTZ Priority shall be configurable from 1 to 10, with higher numbers indicating a higher priority level. Should multiple users request access to the same PTZ camera the highest priority user must be given control.
33. *Configurable Camera Parameters:* The VMS shall provide the following configurable individual camera parameters for all cameras:
34. Enabled. If disabled no recording will take place regardless if recording is enabled elsewhere in the system (e.g., schedule).
35. Name.
36. Resolution, which sets the capture resolution (e.g., 640x480).
37. Video Compression. Selectable from MJPEG, MPEG-4, H.264, and H.265.
38. Time Stamp Overlay, which imposes the date and time in a selectable location of the video input.
39. Camera Name Overlay, which imposes the camera name in a selectable location of the video input.
40. Time stamp, which imposes the camera time in a selectable location of the video input.
41. Stream properties, which imposes the camera’s streaming properties in a selectable location of the video input.
42. Analog camera color, which can be either color or black & white.
43. Continuous Recording, which sets the video recording frame rate for scheduled, continuous recording.
44. Alarm Recording, which sets the video frame recording rate for external alarm events.
45. Motion Recording, which sets the video recording frame rate for motion detection events.
46. Analog Settings, a panel that provides control of various parameters of any directly connected analog cameras. The signal adjustments include Brightness, Contrast, Hue, Saturation, Sharpness, Luma, Croma, and other controls, as well as a Set Defaults reset setting.
47. *Camera Auto-Detection:* The VMS shall provide a camera search-and-add tool for automatically detecting cameras and adding individual cameras or camera groups. The auto detection tool shall have the following capabilities
48. Detection of cameras via Universal Plug and Play (UPnP).

Adding detected cameras, individually or in groups, to the VMS configuration for recording.

Prior to a camera being added the tool shall check to see if a video stream can be acquired preventing misconfigured cameras from being added.

1. *Email Notification of Events:* Provide automated, e-mail notification to one or more recipients when certain alarm events occur on a per camera, pool, or server basis. Enable control of the following parameters upon which an e-mail may be sent:
2. *Event Type Trigger:* Event type that triggers e-mail notification. Configurable event types shall include Sync Loss (loss of video signal), Camera Sync Regained, External Alarm, Motion Detection, Recording Failed, Restart, Recording Server Offline, and Failed Login. Single or multiple events can trigger an e-mail notification.
3. *Image Email Inclusion:* E-mail notifications can optionally include a JPEG still image from the associated camera. The administration can configure a delay period which specifies the number of seconds before the event occurs to capture a snapshot image.
4. *E-mail Subject:* Subject field of the email.
5. *Recipient List:* Multiple recipient email addresses may be specified.
6. *Notification Limits:* Specifying the maximum number of emails which can be sent for an individual event and the minimum time between event notifications.
7. *IP Camera Configuration:* Each camera shall receive its own specific configuration. To reduce redundant data entry, support multiple camera selection for simultaneous configuration as a group. Configuration options shall include:
8. *Camera type:* Used to specify the communication driver for the IP camera or encoder.
9. *ONVIF Profile:* Selection and use of ONVIF Profile S, allowing communication with, configuration of, etc., ONVIF Profile S conformant cameras and other devices.
10. *Generic Driver:* Selection and use of a manufacturer agnostic driver for use with various protocols including ONVIF, RTSP/UDP, RTSP/HTTP, etc.
11. *Camera Address:* Camera unique address, which can be specified as an IP address.
12. *Stream ID:* Used to specify the camera stream when using a multi-sensor device.
13. *Communication Port:* Port numbers such as HTTP or RTSP port.
14. *Camera Logon Credentials:* Camera username and password.
15. *Compression Type:* Video compression type. Supported compression types are MJPEG, MPEG4, H.264, and H.265. Note that compression type is dependent on the camera type and model chosen.
16. *Recording Format:* Provide the ability to record the original video stream from the IP camera/encoder or recompress the video (transcode) to any supported format (MJPEG/MPEG4/H.264/H.265).
17. *Time Zone:* Provide per-camera time zone configuration, allowing the VMS client user to search recorded video according to the camera, or server time zone in the event the camera is in a different time zone than the Recording Server.
18. *Multiple Video Streams:* Provide ability to pull multiple video streams from ONVIF Profile S conformant cameras capable of multiple stream profiles.

Enable selection and configuration of one primary and up to two secondary video streams from the same camera.

Make the camera stream profile assignable to the appropriate VMS recording type (Continuous, Motion, or Alarm).

The VMS shall automatically pull the appropriate stream as required by Live View demands, switching to a higher resolution stream when viewing a larger video tile, and reverting to the lower resolution stream when the larger resolution is not required.

1. *Recording Schedule Planner:* Provide a planner that allows the setting of a recording schedule. Enable the configuration of multiple schedules and allow each camera to have a unique recording plan within the schedule.
2. Allow a schedule to be run on a specific date, run on all weekdays, run on all weekends or to run every day.
3. The recording plan shall specify what types of recording should occur for each camera in a 24 (twenty four) hour period.

Scheduled recording, motion recording, alarm recording and pre-alarm recording shall be configurable recording types within the recording plan.

1. Each camera’s recording plan shall be displayed graphically on a time line. Unique colors will represent the different recording types to allow for easy configuration and identification of recording type(s) running at a given time.
2. Allow for the configuration of scheduled, alarm, motion and pre-alarm recording separately or allow combinations of those recording types to occur at the same time.
3. Camera recording plans shall allow the administrator to configure recording times down to one-minute increments.
4. Provide “copy and paste” function for copying individual camera recording plans to other cameras to reduce configuration time.
5. *Home Preset Schedule Plan:* Include a Home Preset schedule planner that allows the setting of returning a given camera to a given preset at a given day and time.
6. Allow a preset schedule to be run on a specific day, run on all weekdays, run on all weekends or to run every day.
7. The VMS Configuration tool shall support diagnostic and system reporting features.
8. VMS diagnostic and logging reports shall output the complete system configuration (excluding system and camera passwords), full system log files, license key listing and Operating System platform information.
9. VMS diagnostic and logging reports shall include system performance data including performance of Active Directory authentication (if applicable), Disk I/O performance, CPU performance, memory usage and performance as well as NIC interface usage and performance.
10. *NVR and DVR Integration:* Support integration with 3rd party NVR or DVR devices.
11. Support Hikvision and Samsung/Hanwha brand NVRs.
12. Support live video streaming, PTZ camera control, date- and-time based playback from the 3rd party NVR.
    * + - 1. Video Support.

*ONVIF Standard:* Provide support for the ONVIF standard profile S mandatory VMS compliance items, which are shown in List 1 below.

* 1. List 1. Categorized ONVIF Profile S Standard Compliance.
* *General*
  + User Authentication (WS-Username Token)
  + User Authentication (Digest Authentication)
  + Query Services and Capabilities
  + Device Discovery
  + Media Profile Configuration
  + Media Transport (RTP/UDP)
  + Media Transport (RTP/RTSP/HTTP/TCP)Video
* *Video*
  + Video Streaming (MJPEG)
  + Video Streaming (MPEG4)
  + Video Streaming (H.264)
  + Video Encoder Configuration
  + Video Source Configuration
  + Video Streaming (RTSP/RTP)
* *Events*
  + Event Handling (Pull-point)
  + Event Handling (WS-Base-notification)
  + Standard Monitoring Events for Devices
* *Audio*
  + Audio Streaming (G.711)
* *PTZ*
  + PTZ Move (Continuous)
  + PTZ Presets

*Analog Video.* Provide support for up to 64 analog cameras connected directly to Recording Servers via an internal analog video capture card in the server.

*Video Capture Cards.* Analog connectivity for recording servers is achieved via supported PCIe video capture cards. Contact Manufacturer directly for a current list of supported PCIe capture cards.

*Video Capture Resolutions:* Compatible capture cards support the following NTSC analog video resolutions:

*QQVGA:* 160 x 120 pixels.

*QVGA:* 320 x 240 pixels.

*HVGA:* 640 x 240 pixels doubled to 640 x 480 pixels.

*VGA:* 640 x 480 pixels.

*Digital (IP) Video.* Provide test-verified support for the most commonly used analog video camera encoders and IP cameras.

*NOTE:* Manufacturer has tested and verified VMS support for over 3,700 analog video camera encoders and IP cameras including for the types and manufacturers listed below. See the Manufacturer’s online list of supported cameras for the latest compatible make and model information: <https://support.salientsys.com/knowledgebase/supported-camera/>.

*External Analog Video Encoders.* See List 2 below for companies whose analog to digital encoders have verified by Manufacturer as compatible with the its VMS.

* 1. List 2. Supported Analog IP Encoder Manufacturers.

ACTi.

AMAG.

Appro.

Axis Communications.

Bosch.

Digital WatchDog.

Geovision.

Hanwha (Samsung).

Hikvision.

Iteris.

Panasonic.

Pelco.

Sony.

Verint.

VivoTek.

*IP Camera Types:* SeeList 3 below for the types of IP cameras supported.

* 1. List 3. Supported IP Camera Types.

Fixed IP Camera

PTZ IP Camera

Zoom IP Camera

Panoramic IP Camera

Fixed Multi-Sensor IP Camera

IP Multi-View System

Panoramic IP Camera

Multi-sensor PTZ IP Camera

Panoramic / PTZ IP Camera

Fixed IP Camera - Thermal

Fixed Multisensor IP camera

Fixed & PTZ IP multi-imager

*IP Camera Manufacturers:* SeeList 4belowfor the list of manufacturers of cameras that have been tested as compatible with the VMS.

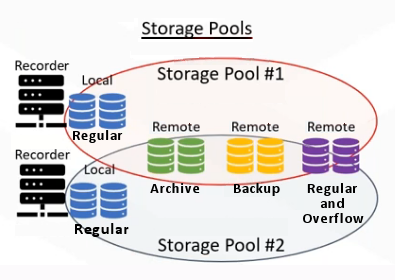
* 1. List 4. Supported IP Camera Manufacturers.

* 3XLOGIC
* ACTi
* Advanced Technology Video
* Advidia
* AMAG
* American Dynamics
* Appro
* Arecont
* Aventura
* Aver
* Avigilon
* AVTech
* Axis Communications
* Basler
* BCS
* Bolide
* Bosch
* Brickcom
* Canon
* Cisco
* Clear2There
* Costar
* Dahua
* Digital WatchDog
* D-Link
* DRS
* DvTel
* EverFocus
* Fine CCTV
* FLIR
* G4S
* Ganz
* GE
* Gen IV
* General Electric (GE)
* Genesis CCTV
* Geovision
* Global
* Hanwha
* Hanwha (Samsung)
* Hikvision
* Honeywell
* ICRealTime
* IDIS
* IDView
* Indigo Vision
* Interlogix TruVision
* InVid
* IQeye
* IQinVision
* JVC
* Lilin
* LTS
* Lumenera
* Mango
* March
* Milesight
* Mobotix
* OnCam Grandeye
* Onix
* OpenEye
* Optiview
* Panasonic
* Patronus
* Pelco
* Probe
* Q-See
* Samsung
* Scallop
* SCW
* Sentry 360
* Shany
* SightLogix
* Siqura
* SmarterCam
* Sony
* Speco
* Stardot
* Stentofon
* Toshiba
* ToughDog
* TRENDnet
* UDP Technology
* Uniden
* Uniview
* Verint
* Vicon
* Video IQ
* Vitek
* VivoTek
* W Box
* Weldex
* Zenitel
  + - * 1. *Scalable Video Storage:* For flexibility in video retention, scalable storage and compatibility with the types of storage available in commonly found in business information systems and data center infrastructure, provide scalable storage pools for Regular, Archive, Backup and Overflow storage. To facilitate effective storage management, provide utilization data, forecasting, and the ability to implement synchronous backup and overflow protection. Base forecasting on a Recording Server’s currently attached cameras.

*Storage Pool:* Scalable, logical collection of one or more physical drives, which may be local to the Recording Server or remote.

*Storage Pool Storage Types:* Provide three types of pool storage – Regular, Archive and Backup – one of which will be assigned to each drive. Allow Storage Retention Policies to be set independently for Regular, Archive and Backup storage.

See Figure 2 below. Also see the current User Manual for Storage Retention Policy details.

*Regular:* Utilized by all cameras for scheduled recording, including continuous, motion, and alarm video. Additionally, individual drives in Regular storage may be selected for Overflow recording, used to ensure video retention policies are met. See Overflow Storage below.

* 1. Figure . Storage Pools.

*Archive:* Archiving is the automated transfer of recordings from Regular storage to Archive storage. Archiving frees up space in the Regular pool to meet retention policies. Archiving is performed after a specified number of days, and can selectively move any combination of continuous, alarm, and motion video.

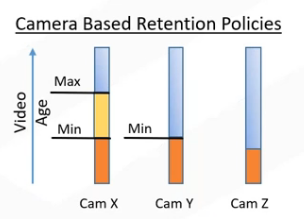
*Backup:* Backup provides a means of redundancy for Regular storage, configurable per individual camera. The Backup function automatically copies continuous, alarm, and motion video from Regular storage to Backup storage, and may take place simultaneously with Regular storage operation.

*Overflow Storage:* Overflow storage is utilized when the Regular storage drives run out of room trying to meet minimum storage requirements.

*Overflow Storage Notifications:* If configured, the system sends notifications when Overflow operation both starts and stops to alert personnel that the Regular pool may need attention.

*Overflow Storage Selection:* Only drives assigned as Regular storage may be used for overflow, and at least two drives must be designated as Regular storage for one or more of the drives to be designated as Overflow storage.

*Storage Retention Policies:* Policies used for setting minimum and maximum retention limits on a per-camera basis.SeeFigure 3below.

*Default To No Policy:* Apply First-In-First-Out (FIFO) equally across cameras when storage is full.

* 1. Figure . Retention Policies

*Minimum Retention:* Sets the minimum number of days a camera's video is stored in the storage pool.

*No Minimum Retention Set:* In the event that storage space runs out with no minimum retention time set, video older than one day will be deleted across all cameras using FIFO.

*Minimum Retention Set with No Maximum Retention Set:* Minimum retention times shall be honored as long as possible. Video older than the cameras' respective minimums shall be deleted using FIFO. If it's not possible to honor minimum retention times, the system shall generate an alarm and send an email notification if configured, provide a visual indicator in the Dashboard, and shall begin cascading video into drives designated for Overflow.

*Maximum Retention:* Sets the maximum number of days a camera's video is stored and creates a point at which deletion of that camera's video begins, regardless of existing free space.

*No Minimum or Maximum Retention Set:* Leaving the Minimum and Maximum Retention settings unconfigured results in video being stored until the storage location is full, at which point FIFO (First In First Out) video deletion occurs.

*Storage Expansion:* In addition to local storage, the VMS shall have the ability to write to DAS, NAS, iSCSI, Fiber SAN and cloud drives, as well as to individual folders on a given drive. Storage pools can be configured to write to RAID levels 0, 1, 5, 6, 10, 50 and JBOD.

*Access to Storage:* All cameras configured on a Recording Server have access to the storage pool, and the drives in the pool may be shared with any other application.

*Storage Pool Notifications:* Provide storage pool notifications as listed below and fully described in the User Manual.

Insufficient Retention (warning).

Write Failed.

Delete Failed.

Free Pool Space Failed.

Storage Threshold Met.

Minimum Camera Retention Active.

Minimum Retention Violation.

Pool Drive Offline.

Pool Drive Online (normal).

Overflow Drive Active.

Overflow Drive Inactive (normal).

*Storage Management:* Provide storage utilization data, forecasting, and the ability to implement synchronous backup and overflow protection. Base forecasting on a Recording Server’s currently attached cameras.

*Retention Storage Analytics:* Provide analytical information on Storage Pool health, capacity, and functionality that is visualized using historical and predictive data graphs.

*Storage Retention Estimates:* Provide historical and predictive data indicating whether or not adequate storage has been allocated to a given camera to meet the configured minimum retention requirements. See example depictions of storage retention estimates in Figure 4 below.

*Continuous Retention Monitoring:* Perform continuous retention monitoring using daily camera consumption, general disk consumption, and current free space. Base analysis on comparing historical averages with current write rates against currently allocated drive space.

*Predictive Warning Alerts:* If the calculated required space is not available, issue an hourly warning until enough space is available by either freeing up existing drive space or adding more drive space.

*Storage Utilization Information:* Shown in Figure 5 below, provide color-coded, automatically updated information displaying current and estimated storage usage by data type. Storage Utilization shall indicateCurrent and Estimated information for:

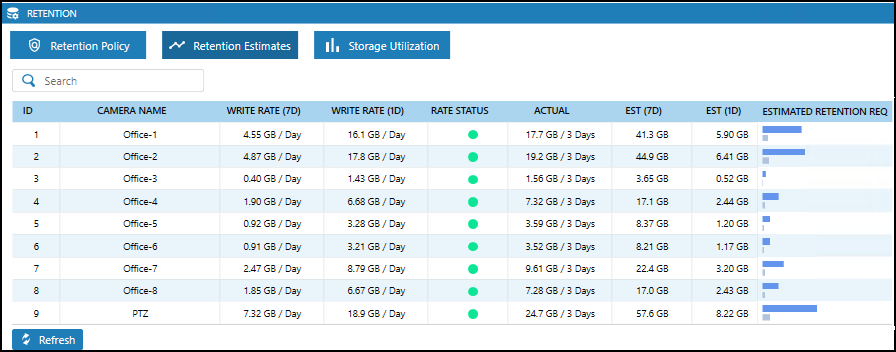
Free space left in the pool.

Space used by cameras with minimum retention policies set.

Space used by cameras with no minimum retention policies set.

Space used by other applications.

* 1. Figure 4. Example Storage Retention Estimates.



* 1. Figure 5. Example Storage Utilization.



* + - * 1. *Motion Detection/External Alarms Capabilities:* The VMS shall provide a comprehensive set of tools for handling security alarms. The following features shall be available.

1. *Motion Detection Zones:* Motion detection shall provide multiple, configurable detection zones in a camera’s field-of-view.
2. Allow the user to set the zones the video motion detection engine should analyze for movement. Provide control of the following parameters:
3. New Zone adds a new zone to be configured via the mouse.
4. Erase Zone removes a selected single zone.
5. Erase All deletes all zones.
6. *Motion Sensitivity Levels:* Motion detection shall be programmable with variable sensitivity levels via a slider.
7. *External Alarms:* External alarms shall trigger alarm recording. External alarm sources available include but are not limited to:
8. Alarms from supported Video Analytic Systems.
9. Alarms from supported Access Control Systems.
10. Alarms from I/O devices. [Contact Manufacturer for list of supported devices]
11. Alarms from supported IP Cameras and Encoders.
12. *External Alarm Configuration:* Provide configuration of program settings which control the software motion detection and external alarm recording behavior of the VMS. Enable control of the following parameters:
13. *Pre-alarm/Pre-motion:* Enable setting the number of seconds to capture video prior to the start of a video motion or external alarm event.

Make the Pre-alarm recording value selectable in 5 second increments and programmable from 0 seconds to 120 seconds prior to the alarm event.

1. *Post-alarm/Post-motion:* Provide separate configurable post alarm or post motion event recording times.

Make post motion and post alarm settings values selectable in 1 second increments and programmable from 0 to 60 seconds after the motion or alarm event.

Provide a configurable Motion Sensitivity setting which selects the sensitivity level of the motion detection engine for the selected camera. Provide a sensitivity scale is from 0 to 100 with a default of 75. Lowering this value shall decrease the sensitivity of the motion detection while increasing the value makes the motion detection more sensitive to change due to movement.

1. *PTZ Automatic Control:* Provide tools for the automatic control of a PTZ camera on motion or alarm event.
2. On motion detection 1 or more PTZ preset positions may be shown across 1 or more cameras.
3. Each motion window shall have an individual list of PTZ movements to control on event.
4. Each motion window may control multiple separate PTZ cameras.
5. There shall be no software-imposed limit on the number of preset positions that can be controlled on a motion event.
6. Each motion window may be prioritized so that in the event multiple windows trigger simultaneously, the highest priority window’s associated actions take place. The priority level shall be selectable between 1 and 10. Lower values shall correspond to lower priority levels.
7. Enable the selection of whether Motion Zone actions take place only on the motion detection recording schedule or all the time.
8. Enable the PTZ camera to be directed to a preset position on alarm event prior to alarm recording.
9. *GeoView Feature:* Provide a feature, which, upon a camera alarm, shall automatically display the live video feed from the activated camera in one video tile, and the relevant map in its own tile, provided the “Worldmap” is currently loaded.
   * + - 1. *Audio Recording:* Provide recording of audio with video through the use of Manufacturer-supported audio capture adaptors (check with Manufacturer for currently supported devices). Additionally, provide the capability of capturing audio directly from supported IP cameras, including the following features.
10. *Audio Stream Parameters:* Allow an audio stream to be assigned to an analog or IP video channel. Provide the following controllable parameters:
11. *Enable Audio:* Attaches an audio stream to a selected video source.
12. *Audio Source:* Specifies which audio device to use.
13. *Channel:* Allows assigning of either right or left audio channel if Split Channels audio mode is selected. A single stereo audio provides input to two separate channels when using the appropriate adapter.
14. *Audio Capture Adaptor:* Allow independent control of each audio capture adaptor device properties for the following parameters:
15. Capture Quality: Selectable from low, medium and high.
16. *Channel Mode:* Selects the operation mode of the audio input from Mono, Stereo and Split Channels.
17. *Audio Capture:* Capture audio from supported IP cameras and encoders.
18. Capture audio synchronized with the video when recorded with MPEG4, H.264, & H.265 video streams.

*Audio format:* G.711 µ-Law.

*Capture protocol:* RTSP over HTTP or RTSP over UDP.

* + - * 1. *Resource Optimization:* Allow configuration of certain communications between components to deliver data only when requested in order to reduce bandwidth consumption across networks.

1. Configurable elements shall be:
2. Status enquiry period between the selected Recording Server and Management Server/Desktop Client
3. On-demand event notification between the selected Recording Server and Management Server/Desktop Client
4. *Dynamic Resolution Scaling:* Minimize the bandwidth of data sent to displays for either live or recorded video, to provide for the lowest possible bandwidth consumption without sacrifice of display quality.
5. While video sent from the camera is recorded in its original resolution, have the server automatically resize the video stream sent to the display based on the size of the display window.
6. Make the viewing pane resizable at any time and have the server automatically adjust accordingly with no user intervention required to adjust the video stream.
7. *Dynamic Video Decoding:* Monitor which camera feeds are currently being viewed. Do not process feeds that are not being actively viewed, significantly reducing CPU load.
8. *Dynamic Frame Throttling:* Monitor incoming video queue length. When queue length exceeds a certain threshold set in Server Configuration Advanced panel, engage and process only key video frames until the queue length is restored to normal levels.
9. *On-Demand Camera Streaming:* With the intent of overall network bandwidth use reduction, provide a feature whereby the VMS will deliver video output from the selected camera only when live viewing is requested by a VMS client. On-Demand camera configuration shall support low, medium, and high resolutions at any FPS setting.
   * + 1. MANAGEMENT SERVER
          1. *Management Server:* Provide a Management Server software component which centrally stores all business, user, and system data which can be shared among all components of the VMS. Support Roaming User accounts whereby users shall be able to log into any workstation running Desktop Client software and the Management Server shall provide their account information and configuration. The Management Server shall also be responsible for centralized user authentication, authorization, and client configuration.
10. *Client Configuration Management:* Have the Management centrally store VMS user client configuration. When a user of the VMS client logs in, download their configuration to the workstation they are using, allowing users to maintain their configuration when logged into any workstation running VMS client software.
11. *System Health Monitoring:* The Management Server shall provide system administrators with the ability to monitor the overall system health, which includes camera, storage and server connectivity of every Recording Server connected to the Management Server.
12. *Software Updates:* The Management Server shall enable administrators to push software updates to Recording Servers remotely.
13. *Recording Server Camera Migration:* The Management Server shall support the copying and/or moving of cameras between Recording Servers
    * + - 1. *SQL Server:* The Management server utilizes a SQL Server instance that is typically installed on the Management Server computer or virtual machine. SQL Server Express is installed as part of the Management Server software installation.

*SQL Server Versions:*

*Current Version Provided with Management Server:* SQL Express 2019.

*Previous SQL Server Express Versions Supported:* 2014, 2016, and 2017.

*System Upgrades:* As part of the setup process, previous versions of CompleteView may have installed SQL Server Express as the default database. If upgrading from a previous version of CompleteView using SQL Express, no changes will be made to the existing database, but a new database will be created using the included migration utility.

*Migration from SQLite:* SQLite is not supported in versions 7.0.0 and newer. Existing installations of the SQLite database will need to be upgraded to SQL Server Express, either during Management Server installation via the integrated migration utility or as installed separately by an Administrator before VMS installation.

* + - 1. DESKTOP CLIENTS
         1. *Desktop Client:* Provide a Desktop Client software component, wherein all configuration, live viewing, playback, alarm, system monitoring, retrieval of archived video, and system management functions shall be accessible by authorized users from within a single unified interface.

1. *Unlimited Client Use:* Allow an unlimited number of client applications to be utilized.
2. *User Authentication:* Enable the use of either application-specific credentials or integration with Active Directory.
3. *Customization:* Make the appearance and functionality of the client customizable and apply a user’s customizations to any client instance the user logs into.
4. *Language Localization:* Provide manual selection of supported localization from the initial client login screen.
   * + - 1. *Client Configuration:* Enable View layout and Map configuration to be controlled by authorized users through the Configure tool from within the Desktop Client. Client configuration shall be stored centrally and accessible from any network connected workstation. The Configure tool shall allow for:
5. *User Setup:* Setup of users and groups that may access the client configuration. The users and groups must have a corresponding user/group setup on the Management Server connected to the Recording Servers from which the video is sourced.
6. *Importing of New Users and User Groups:* AD/LDAP shall be supported to allow importing of users and groups existing elsewhere on the network.
7. *VMS Tool Automatic Startup:* Automatic startup of the various tools (Live View, Dashboard, etc.) located within the Desktop Client application.
8. *Hierarchical View Configuration:* Configuration of a hierarchical organization (Structured View) to contain view layouts and maps within. The hierarchy may consist of sites including Regions, Country, State, City, Building, School, and Store used to organize individual or multiple view layouts and maps.
9. Sites shall be able to contain View Layouts and Maps.
10. There shall be no software imposed limit to the number of sites which can be configured.
11. Each site shall have a customizable name, allowing for easy identification of what the structure represents.
12. Each site shall have individual user and group access rights. Users or groups of users who are not permissioned to view a given site shall not see the site or any other sites contained within a non-permissioned site.
13. *Configuration of Multiple Recording Servers:* The Configure tool shall allow the administrator to add multiple VMS Recording Servers to the client configuration. Tiled view layouts and maps can be populated with cameras from a single or multiple Recording Servers.
14. *Configuration of Unlimited Tiled View Layouts:* The Configure tool shall allow the configuration of unlimited tiled view layouts for the display of live video for a given Recording Server. Tiled view layouts can be configured per user or group. Up to 100 cameras can be auto set up for viewing on a target display in configurable grid arrangements.
15. View layouts shall have no software imposed limitation on the number of cameras which can be viewed per target monitor.
16. 4 x 3 or 16 x 9 (widescreen) or 9 x 16 target displays shall be supported
17. 4 x 3 or 16 x 9 (widescreen) or 9 x 16 (Corridor View) video feeds shall be supported within the display. A mix of 4 x 3, 16 x 9 and 9 x 16 video tiles shall be configurable in a single view layout.
18. Video feeds shall be added to a view layout by drag-and-drop of the selected camera to the “drawing surface”, which represents the target monitor.
19. The video tiles shall be easily stretched, shrunk or moved by a snap-to-grip functionality. Layouts shall optionally be drawn free form without a snap-to-grid function.
20. View layouts can be optionally added to a sequence with a configurable dwell time (in seconds).
21. The video tiles shall be capable of containing maps.
22. *Configuration of Site Maps:* The Configure tool shall allow for the setup of map based display of video. Unlimited site maps can be configured per user or group.
23. The Configure tool shall support:

Importing unlimited JPEG or BMP files as Maps.

The use of online satellite imagery for map usage, provided Internet connectivity on the Recording Server.

Unlimited cameras per Map.

1. Maps can be hyperlinked. Maps may be hyperlinked to unlimited levels.
2. The Configure tool shall support drag-and-drop based configuration of maps, so that any other map as well as cameras can be positioned easily on the target map.
3. A live image from the target camera shall be displayed on mouseover for easy identification of camera position and field-of-view
4. Each camera can be configured with a cone representing the camera’s field-of-view. Cone angle, width and length may be controlled.
5. The Configure tool shall allow the administrator to set which live viewing elements will be accessible to the user. The administrator shall be able to enable or disable the display of live view layouts, maps, Sites/Zones or servers & cameras from the VMS client user.
   * + - 1. *Live View Capabilities:* The Live View application from within the Desktop Client shall provide a comprehensive set of features for the monitoring of video. These features shall include:
6. Simultaneous recording, live view, playback and export of video.
7. Display of any number of live cameras concurrently per monitor. Allow video to be displayed on multiple monitors by opening multiple tabs within Live View. There shall be no software imposed limitation on the number of tabs open simultaneously.
8. Unlimited, customized viewing layouts per user.
9. Ability to display view layouts organized in a hierarchy of Site folders. The hierarchy shall include both Regions and Site.
10. Widescreen or standard displays in both 4 x 3, 16 x 9 and 9 x 16 aspect ratios.
11. 16 x 9 aspect ratio cameras, 4 x 3 aspect ratio camera and 9 x 16 aspect ratio camera sources.
12. Display of tiled video views in full screen mode and filling the entire screen.
13. Display of a single camera full screen when the user double clicks the associated video tab.
14. Full screen on demand.
15. Custom display size for each camera individually.
16. Changing view layouts via “dragging and dropping”.
17. Limiting access to view cameras user by user.
18. Per-camera adjustable frame rates.
19. Color indicators showing the real time status of motion detection, events and recording status on camera title bar display or as a colored border around the video tile.
20. Ability for users to change view layouts by clicking the desired administrator or individually configured view layout in the tree-view. Users shall be able to enter sequence mode where the Live View automatically switches between view layouts at preconfigured dwell times.
21. Displaying maps within a video view layout.
22. Maps displayed within a video view layout shall have full functionality including links to other maps within the system, cameras overlays, field of view cone representations and visual activity indicators.
23. Control of Pan-Tilt-Zoom (PTZ) cameras via on screen buttons, a virtual joystick or an attached USB joystick. Using digital PTZ as well as Axis or Panasonic mechanical PTZ cameras, PTZ camera functions can also be controlled by click on the video to center where the user clicks. Live View shall provide:
24. Control of PTZ speed.
25. Enabling and disabling of automated PTZ tours.
26. Manual control of camera Iris, Focus, Auto Iris and Auto Focus.
27. Access to view any PTZ preset location if authorized.
28. Access to set PTZ preset location if authorized.
29. “Quick review” feature which buffers video from all cameras for instant replay. Quick review shall allow access to video from 30 seconds to 10 minutes back per camera. Quick review shall be accessible from tiled video displays and maps.
30. Access to a mapping interface with the following capabilities:
31. Maps can be displayed full screen on demand.
32. Controls to toggle the display of map hyperlink and camera labels.
33. Controls to adjust the zoom level of the map.
34. Live video pop up window when a user hovers the mouse over a camera icon.
35. Pop up window with live video and PTZ controls when a user double clicks the camera icon.
36. Display of preconfigured field-of-view cones representing the cameras position and field-of-view.
37. Field-of-view cones shall change color indicating motion events, external alarm events, camera status, and recording status.
38. User shall be able to navigate to multiple maps by double clicking a map icon located on the current map or by clicking on the desired map in a tree-view.
39. The ability to display maps organized in a hierarchy of sites.
40. Functionality for the system operator to record cameras of interest as their own video feed in the VMS Video Client. This “QuickTrack” functionality shall allow the user to drag and drop any accessible camera to a designated view area panel for recording. This function shall allow for easy review of tracking suspects or objects of interest across multiple cameras.
41. Support for Dynamic Resolution Scaling.
    * + - 1. *Alarm Video Monitoring:* Enable the displaying of video only when an alarm condition is present through the Live View. In addition, a history will be maintained of the one hundred (100) most recent camera alarms. The video for any of these stored alarms may be recalled quickly and then displayed in a side-by-side display with live video from the associated camera, using the Desktop Client’s Alarm View module.
42. Alarm View shall:
43. Display video from associated cameras on an external alarm event and/or motion detection event.
44. Provide an audio notification upon an external alarm event and/or motion detection event.
45. Display a normally blank 8 camera view, but shall be configurable to display up to 64 cameras. Video shall be displayed in the first available empty tile on event.
46. Multiple cameras may be associated with the Alarm View for monitoring. There shall be no software imposed limit to the number of cameras which can be monitored.
47. Alarm View shall maintain a history list of the last 100 alarm or motion events. Quick recall of recent alarms shall be possible via a double click on any event in the Alarm Event list to open a new alarm review window that displays both the recorded alarm video and the live video from the camera. PTZ controls are displayed for live PTZ cameras.
48. Cameras from a single or multiple Recording Servers may be monitored simultaneously in Alarm View.
49. There shall be no software imposed limit on the number of cameras which can be monitored by a single instance of Alarm View. There shall be no software imposed limit on the number of Alarm View which can operate simultaneously on a single workstation.
50. The VMS shall maintain a log of the last 500 alarm events.
    * + - 1. *Recorded Video Playback and Search:* The Desktop Client application shall provide a comprehensive set of search tools for the investigation of security events.
51. The VMS Playback module shall provide single camera playback that includes:
52. Playback clips from any camera on any server.
53. Search by date/time.
54. Video clips are color coded to indicate motion, event or scheduled recording.
55. Video clips can be filtered by recording type. Users can specify to view only motion, external alarm or scheduled recordings, or any combination of those types.
56. Playback controls shall include play, pause, rewind, fast-forward, frame advance, frame reverse, next clip, previous clip, and I-Frame only playback.
57. Playback shall provide adjustable playback speed.
58. Playback shall allow for export of video clips in AVI format to thumb drive or any location on disk.
59. Playback shall allow taking of a snapshot that may be digitally zoomed, saved, printed, etc.
60. Snapshot shall include “smooth zoom” feature to significantly reduce pixilation introduced by digital zooming.
61. Video may be exported with an optional executable player that allows for verification that no tampering or modification has occurred on the exported video clips.
62. Playback shall provide an Export Queue which allows for central access of “bookmarked” video clips.
63. Playback shall allow multiple clips to be added to the export queue.
64. Playback shall allow for unique text descriptions of each video clip.
65. Playback shall allow for export of all video clips in the queue to thumb drive or any location on disk.
66. Playback shall support multi-camera playback that includes:
67. Play back video from up to sixteen (16) cameras simultaneously.
68. Play back of cameras from a single or multiple Recording Servers.
69. A color coded bar graph showing when and what types of recordings are available from each camera.
70. Standard playback controls including play, pause, rewind, fast-forward, frame advance, frame reverse, next clip and previous clip.
71. Adjustable playback of up to 1600% of original speed.
72. Taking of a snapshot that may be digitally zoomed, saved, printed, etc.
73. Recordings may be exported with an optional executable player that allows for verification that no tampering has occurred during the copy and export process.

The VMS Video Player shall have the ability to play back between one and sixteen exported video clips simultaneously.

1. Playback shall provide a thumbnail search capability allowing users search recorded video by viewing a series of thumbnail images between a defined timeframe.
2. Playback shall support displaying up to 36 thumbnails between the defined time rage of the search.
3. Users shall be able to zoom into a segment of the search time range by clicking one of the thumbnails. The time range represented by the thumbnail will be divided into segments (up to 36) each with its own thumbnail image preview.
4. Playback shall support Dynamic Resolution Scaling.
   * + 1. SYSTEM FUNCTIONALITY
          1. *Pan-Tilt-Zoom (PTZ) & Fisheye Camera Controls:* The VMS shall provide the ability to control one or more PTZ cameras using either analog or IP protocols. The following control protocols are supported at the time this specification was published.
5. *Analog PTZ Control Protocol:*
6. American Dynamics ASCII Continuous
7. American Dynamics Make/Break
8. AD Pelco P
9. Canon VCC-4
10. Kalatel
11. Digital CompleteView
12. Panasonic WV-CS850 Conventional
13. Panasonic WV-CS850 New
14. Pelco ASCII
15. Pelco D
16. Pelco P
17. Philips Biphase
18. RVision
19. SAE
20. Samsung
21. Sensormatic
22. Sony VISCA EV1-D30/D31
23. Ultrak K6 (Diamond)
24. VCL
25. Vicon
26. *IP PTZ Control Protocol:*
27. ACTi HTTP IP
28. ACTi Pelco D IP
29. ACTi Pelco P IP
30. AD Illustra
31. AD
32. Axis V2 IP
33. Axis V2 IP V 4.0
34. Bosch BiCom
35. Bosch OSRD
36. Bosch Pelco D
37. Brickcom
38. Canon
39. Cisco IP
40. Dahua IP
41. Digital
42. FLIR
43. Generic-D
44. Hikvision Speed Dome
45. Mobotix IP
46. Panasonic IP
47. Pelco API
48. Pelco
49. Samsung
50. Samsng IP v.2
51. Sony IP Continuous Move
52. Sony IP Move
53. Sony P5 IP
54. Sony VISCA IP
55. Speco IP
56. Symmetry ENVS IP
57. Toshiba IK-WB IP
58. Toshiba IK-WB21A IP
59. Vivotek
60. *360 Dewarping:*
61. ACTi
62. Axis Communications
63. Immervision
64. Hikvision
65. Oncam Grandeye
66. Sentry 360
67. Vivotek
68. Provide the ability to digitally Pan Tilt and Zoom any fixed camera using the same PTZ controls used for mechanical PTZ cameras.
69. Provide the ability to automatically return a PTZ camera to its specified Home position after a configurable period of inactivity.
70. Control multiple user access to a single PTZ camera by a configurable user or group priority level (reference section D3). In the event a user attempts to control a PTZ camera when an equal or higher priority user is currently controlling the camera an “Arbitration Timeout” setting shall allow the administrator to specify the number of seconds VMS waits before relinquishing control to the second user.
71. Provide configuration of preset tours for Pan Tilt and Zoom capable cameras. The PTZ Preset Tour shall automate camera movement between two or more preset locations. The VMS software shall be capable of configuring an individual PTZ tour for each PTZ capable camera. The PTZ Tour configuration options shall include:
72. Up to 100 preset locations.
73. Configuration of a dwell time between preset locations. The dwell time is the time the camera spends on a preset location before moving to the next location specified in the tour. Each preset location can have an individually configured dwell time.
74. Enabled automatically or disabled on VMS startup.
75. Users shall have the ability to configure names for preset positions.
76. Provide the ability to automatically stop a preset tour when a user attempts to control the camera.
77. Provide the ability to automatically restart the tour after a configurable period of inactivity.
78. Provide an “Automated Attendant” feature that allows programming of fixed cameras that detect motion to direct a PTZ camera to move and focus on a preset location. This flexibility provides security coverage in multiple locations with multiple views. Parameters include:
79. *Location Priority:* Giving “high priority” status to important locations so the view is maintained despite activity in lower priority areas.
80. *Motion Zone Priority:* Providing 10 (ten) motion zone priority levels.
81. *Hold Time:* Adjustable Hold Time prior to responding to a lower priority alarm.
82. *Dwell Time:* Adjustable Dwell Time before cycling to a motion alarm with the same priority.
83. *Zone Cycling:* When motion detection is detected in multiple zones with the same priority level, alternate between the alarmed presets.
84. Provide integration with client-side dewarping with the following list of manufacturer’s 360/Fisheye cameras:
85. Immervision
86. Sony
87. Brickcom
88. Samsung
89. Vivotek
90. Sentry 360
91. Provide integration with camera-side dewarping with the following list of manufacturer’s 360/Fisheye cameras:
92. Axis
93. ACTi
94. Mobotix
95. Arecont
96. Support the ability to save camera positions from supported fisheye camera with client-side dewarping. Camera positions shall be configurable by the system user. 
    * + - 1. *Input/Output Devices:* Provide tools for the configuration of various IP and / or USB connected IO devices which can trigger alarm recording. The following features shall be available.
97. *Connection Options:* Individual connection options for IP alarm I/O devices. There shall be no software imposed limit to the number of IP connected IO devices. The following parameters shall be controllable:
98. *Device Model:* Allows selection of the specific device model.
99. *Address (IP):* Provides the IP address for the selected device.
100. *Username:* Provides the username that the server will use to contact the device.
101. *Timeout:* Controls how long, in seconds, the VMS should wait for a response to an initial HTTP request.
102. *Retries:* Controls how many times the VMS should attempt to connect to the IP camera before declaring it unreachable.
103. Provide control of recording actions when the state of the associated input changes. Each input on the associated device may have its own configurable recording actions. The following features shall be available:
104. Each input can trigger recording on a single or multiple cameras.
105. Multiple inputs can trigger recording on the same or different cameras.
106. Alarm event triggers can occur when an input is closed or open, based on administrator configuration.
107. Provide automatic control of the outputs associated with the I/O device. The following features shall be available:
108. The output may be set to close or open on event.
109. Events that can trigger output control shall be camera Sync Loss (signal loss), Motion Detection or External Alarm. Any combination of those shall be programmable.
110. It shall be possible for the administrator to associate events from multiple cameras for automatic triggering of the output.
111. When multiple events and/or multiple cameras are selected to trigger a single output any selected event on any selected camera shall trigger the output.
     * + - 1. *Pop Up Event Notification:* Provide the capability to display video popup windows on external alarm or motion detection event using the VMS SpotLight application. The VMS SpotLight application shall be usable as a stand-alone client application or in conjunction with other VMS client applications to add video popup and audio alerts on event.
112. The VMS SpotLight application shall display video from associated cameras on an external alarm event and/or motion detection event.
113. SpotLight shall run in the Windows System Tray, and not be otherwise visible or use desktop space until an external alarm event and/or motion detection event occurs.
114. Multiple cameras may be associated with SpotLight for monitoring. There shall be no software imposed limit to the number of cameras which can be monitored.
115. Cameras from a single or multiple Recording Servers may be monitored simultaneously in the VMS Alarm View.
116. Multiple monitors shall be supported, and SpotLight shall be configurable so the user can select which monitor and corner of the screen to display video popup windows in.
117. Individual sound clips (WAV files) can be configured for single or multiple cameras to play when an external alarm and/or motion detection event occurs. Each camera configured for monitoring can have a different sound clip associated to it, or no sound at all.
118. SpotLight shall display on top of any open window on the monitor/corner of the screen configured to be used by the client. The action of displaying on top of other windows shall not take over keyboard focus from other applications the user may type in at the time of a popup event.
119. SpotLight shall be configurable so each camera can popup in a user configurable corner of the screen or full screen and on any combination of monitors connected to the computer, up to 8 simultaneously.
120. SpotLight shall have a text based alerts mode optionally available to the user. In text alert mode, the user will see text alerts describing the camera, associated Recording Server and event type on an event in place of video. The user will be able to click the text alert to display video of the event.
     * + - 1. *Systems Integration:* Provide capabilities for integrated operations with other security related systems such as for Access Control, Building and Perimeter Intrusion Detection, Central Station Monitoring and Video Analytics. Integrated manufacturers at time of publication of this specification include:
121. Access Control System Products:
122. AMAG
123. Apollo
124. Continental Access
125. DSX
126. Feenics
127. Frontier by Matrix
128. Identicard
129. Lenel OnGuard
130. Maxxess
131. Precision Edge Access Control, Inc. (formerly Novus Edge)
132. Open Options
133. S2 Security
134. Software House (CCURE 9000)
135. Red Cloud
136. RS2
137. Vanderbilt
138. Video Analytics System Products:
139. AMAG
140. Axis
141. Bosch
142. Hikvision
143. Mango / Mate
144. Samsung/Hanwha
145. SightLogix
146. Video IQ
147. Vivotek
148. Central Station Monitoring System Products:
149. Bold Manitou
150. SureView Immix
151. IDV Solutions
152. NOTE: The list of integrated ACS, CSMS and VAS products is expanding rapidly. Please check with Salient for the latest listings.
     * + 1. REMOTE VIDEO MONITORING
            1. *Remote Web Video Monitoring.*
153. Provide a Web Client to enable authorized users to remotely view live video, playback recorded video and export video via Firefox, Chrome, or Edge browsers.
154. The Web Client shall use HTML5 for cross platform compatibility and live streaming MJPEG support.
155. The Web Client shall provide live streaming and streaming of recorded video in MJPEG format.
156. The Web Client shall provide supported localized experience.
157. The Web Client shall support Dynamic Resolution Scaling of video for both live and recorded video streaming.
158. The VMS shall provide its own web server software fully integrated and not require a 3rd party web server such as Microsoft IIS or Apache be used for the web client functionality. This shall provide a higher level of security and easier configuration as compared to integrating with a 3rd party web server application.
159. The VMS web server shall support HTTP and HTTPS connections.
160. There shall be no software-imposed limitation on the number of simultaneous connections to the Web Client.
161. Log-in and authentication is required when connecting to the system via the Web Client.
162. The Web Client shall provide playback features which include:
163. Playback of a single camera.
164. Search by date/time.
165. Video clips are represented on a scrub bar for review of recordings and video events. Video recording types shall be color coded to indicate motion, event or scheduled recording.
166. Video clips filterable by recording type.
167. Users can specify viewing only motion, external alarm or scheduled recordings, or any combination of those types.
168. Standard playback controls that include play, pause, rewind, fast-forward, frame advance, frame reverse and a scrub bar to control the playback position.
169. The playback window size can be scaled by user controllable buttons to a larger or smaller size.
170. The Web Client shall provide adjustable playback speed to play back video.
171. Exporting of clips to thumb drive or any location on disk.
172. Taking of a snapshot that may be saved to a thumb drive or any location on disk.
173. Playback of cameras from a single NVR or multiple NVRs.
174. The Web Client shall provide extensive live viewing functionality to include:
175. Switch viewing among multiple live camera layouts (single and multiple cameras).
176. Any view layout shall support displaying video from a single or multiple NVRs simultaneously.
177. The live view layout size can be scaled by user controllable buttons to a larger or smaller size.
178. The Web Client shall support true full screen display of any camera, which will display the camera outside of the maximum viewing area of the web browser window to utilize all of the viewing screen resolution.
179. The Web Client shall provide Pan Tilt and Zoom camera controls that include:
180. PTZ camera movement that can be controlled by control buttons (Up, Down, Left, Right, Up Right, Up Left, Down Right, Down Left, Zoom in & out).
181. PTZ preset positions that can be set or shown by the user (provided they have been granted permission to access the preset positions).
182. PTZ camera speed that can be controlled.
     * + - 1. *Mobile Device Video Monitoring:*
183. Provide Mobile Client viewing applications for Android, iPhone and iPad platforms.
184. The Mobile Client shall support viewing of live video via multiple view layouts.
185. The Mobile Client shall support displaying multiple, individually configured, view layouts in both portrait and landscape viewing modes.
186. The Mobile Client shall support streaming audio on audio-enabled cameras.
187. The Mobile Client shall support playback of recorded video.
188. VMS Recording Server, camera, date & time of the recording and recording type (motion, scheduled and alarm) shall be searchable or filterable criteria
189. The Mobile Client shall support:

A means of quickly moving through the recorded clips.

Adjustable playback speed, rewind, skip to beginning/end of clip, pause and play controls for playback of recordings

Playback of recorded audio.

1. The Mobile Client shall support Dynamic Resolution Scaling, which requires the VMS Recording Server to transmit only the resolution sized to display on the mobile device, reducing the bandwidth consumed for live display of video.
2. The Mobile Client shall support Pan Tilt and Zoom camera control.
3. The Mobile Client shall provide PTZ control buttons including move up, down, left, right, up left, up right, down left, down right, zoom in & out.
4. The Mobile Client shall support showing preset positions preconfigured on the VMS Recording Server.
   * + 1. SYSTEM HARDWARE
          1. Computing and Storage Hardware Compliance Requirements:
5. FCC CFR 47 Part 15 Class A – Telecommunications – Radio Frequency Devices – Digital Device Emission.
6. UL 60950-1 Information Technology Equipment – Safety.
   * + - 1. Servers, Workstations and Storage Systems:
7. Servers, workstations and storage systems shall be standalone or integrated products from a recognized industry leader.
8. Hardware may be supplied by the VMS manufacturer, an integrator certified by the VMS manufacturer or by the client IT team.
9. All server and storage hardware platforms must be capable of mounting in a standard nineteen inch (19”) equipment rack and accepting power, network and other standard IT wiring connections.
   * + 1. SYSTEM SECURITY
          1. System Computer and Network Security: See the Manufacturer’s hardening guide.
          2. Secure System Communications:

Secure Communications: Provide secured communication via HTTPs using between the VMS servers and the Desktop Client, Web Client and Mobile Client software.

Web Client: Provide SSL/TLS-secured communication via a supported browser.

Management Server: Maintain a configurable list of approved host addresses with which various clients and Recording Servers may communicate, referred to as a Cross-Origin Resource Sharing (CORS) Whitelist.

* + - * 1. User Password Management:

Initial Password Change: Upon initial login, require changing the default Admin password.

Password Strength Requirements: Require a user’s password to meet the following criteria:

The password is at least eight characters long.

The new password must not be the same as the current password.

The password must contain characters from 3 of the following 4 categories:

Latin uppercase letters (A through Z).

Latin lowercase letters (a through z).

Base 10 digits (0 through 9).

Non-alphanumeric characters such as:  
! @ # $ % ^ & \* ( ) - . \_ + / [ ] { } ?

*Digital Certificates:* See the Manufacturer’s User Manual for details digital certificate usage requirements and options.

*Self-Signed Digital Certificates:* The Management Server provides support for self-signed certificates.

*Third-Party Digital Certificates:* The Recording Server provides support for digital certificates from a third-party, such as a Customer’s internal or external Certificate Authority or a digital certificate service provider.

* + - 1. LICENSING
         1. *Licensing:* The VMS manufacturer shall license the software on a per video channel basis only, in such a way that there are no license fees associated with client applications, site installation, user accounts, or add-on features. The licensing program characteristics are:

1. IP camera license shall be tied to an IP address not a hardware address (MAC Address).
2. VMS server software licenses shall not be tied to server hardware.
3. All VMS software modules shall be included in the base VMS software cost. Modules include Management Server, Recording Server, Desktop Client, Web Client, Mobile Client, and SpotLight.
4. Client applications may be installed an unlimited number of times and may be running simultaneously without additional licensing cost.
   * 1. EXECUTION
        1. EXAMINATION
           1. Examine area to receive devices and notify any adverse conditions affecting installation or subsequent operation.
           2. Do not begin installation until unacceptable conditions are corrected.
        2. PREPARATION
           1. Protect devices from damage during construction.
        3. INSTALLATION
           1. Install devices in accordance with manufacturer’s instruction at locations indicated on the floor drawing plans.
           2. Perform installation with qualified service personnel.
           3. Install devices in accordance with the National Electrical Code or applicable local codes.
           4. Ensure selected location is secure and offers protection from accidental damage.
        4. FIELD QUALITY CONTROL
           1. Test snugness of mounting screws of all installed equipment
           2. Test proper operation of all VMS devices.
           3. Determine and report all problems to the manufacturer’s customer service department.
        5. ADJUSTING
           1. Make proper adjustment to video system devices for correct operation in accordance with manufacturer’s instructions.
        6. DEMONSTRATION
           1. Demonstrate at final inspection that the VMS is functioning properly.
5. End of Section