CompleteView Enterprise

Video Management System

Architectural and Engineering Specifications
CSI Master Format

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Product Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, based on *MasterFormat 2018. The Manufacturer is responsible for technical accuracy*. *By removing the references to specific Salient product names or part numbers, the 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.* Coordinate this section with other specification sections and the Drawings.

SECTION 28 23 00
VIDEO MANAGEMENT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:
1. Video Surveillance Control and Management Systems (VMS).

B. Related Sections:
1. Section 27 15 01 – Conductors and cables for electronic safety and security.
2. Section 28 05 13 – Servers, Workstations and Storage for Electronic Safety and Security.
3. Section 28 05 21 – Network Attached Storage for Electronic Safety and Security.
4. Section 28 05 31 – Communications Equipment for Electronic Safety and Security.
5. Section 28 05 33 – Safety and Security Network Communications Equipment.
6. Section 28 20 00 – Access Control for video surveillance.
7. Section 28 21 00 – Surveillance Cameras.

1.2 REFERENCES

A. FCC CFR 47 Part 15 Class A – Telecommunications – Radio Frequency Devices – Digital Device Emission

B. UL 60950-1 Information Technology Equipment – Safety.

1.3 SUBMITTAL

A. Submit under provisions of Section [01 33 00].

B. Product Data:
1. Manufacture's data, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for a complete VMS.

C. Shop Drawings:
1. System device locations on architectural floor plans.
2. Full schematic of system including wiring information for all devices.

D. Closeout Submittals:
1. User manuals.
2. Parts list.
3. System device locations on architectural floor plans.
4. Wiring and connection diagrams.
5. Maintenance requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of ten (10) years experience in the manufacture and design of VMS products.

B. Installer:
1. Minimum of five (5) years experience installing VMS products.
2. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section [01 60 00] Product Requirements.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with original identification labels.

C. Protect stored materials from environmental and temperature conditions following the manufacturer's instructions.

D. Handle and operate products and systems according to the manufacturer's instructions.

1.6 WARRANTY

A. Provide manufacturer's warranty covering one (1) year for replacement and/or repair of defective equipment.

1.7 MAINTENANCE

A. Make ordering of new equipment for expansions, replacements and spare parts available.

B. Provide factory direct technical support to the installing firm.

C. VMS system manufacturer shall offer online, self-paced training for installers, system administrators and users. Online training shall be accessible from VMS system manufacturer's website at any time.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
The Video Management System shall be the CompleteView Enterprise System as supplied by:
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B. 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.

2.2 VIDEO MANAGEMENT SYSTEM COMPONENTS

A. Components

The networked Video Management System (VMS) shall consist of the following components:

1. Scalable video management software hosted on commercial grade servers with Microsoft Windows operating system.

2. Industry standard server and storage platforms supplied by Salient, Salient certified integrator or customer supplied.

3. The VMS shall be a true hybrid system capable of integrating existing or new analog and/or IP cameras into the IP infrastructure.

4. The VMS shall support virtually all leading IP and analog camera and encoder manufacturers for user choice and design flexibility.

5. The VMS shall provide a Desktop Client software component, wherein the following functions shall be accessible by authorized users from within one, unified interface:
    a. Live video monitoring
    b. Real-time alarm monitoring and display
    c. Alarm display prioritization
    d. System management
    e. Instantaneous retrieval of archived video
    f. Evidence production on AVI files that can be viewed on any PC

B. Video Management System Concept of Operation

The VMS and its manufacturer shall provide the following key functions and capabilities:

1. The system shall operate in a Microsoft Windows environment. It shall be an IT server based solution purpose-built for the capture, processing, storage and retrieval of unlimited amounts of digital video and supporting audio, alarm, associated systems (access control, etc.), and other surveillance data.

2. The VMS shall support a wide range of deployments including new, all-IP camera environments as well as incorporating existing analog cameras, cabling and other security and IT infrastructure where appropriate to maximize existing investments.

    a. The VMS shall integrate with Axis One Click Connection Component v1.0, v1.4 & v2.0 which enables the Axis One Click Connection method of installing Axis Communications cameras.

3. The VMS software shall operate consistently on stand-alone or integrated host and storage platforms from recognized IT industry suppliers. This hardware independence shall allow the host and storage platforms to be sourced from the VMS manufacturer, an integrator certified by the VMS manufacturer or supplied by the customer for optional loading and certification by the VMS manufacturer at the manufacturer's facility.

4. The VMS shall capture video, audio, alarm, associated systems and other data from a single or multiple servers.

5. Each server shall be capable of up to sixty four (64) direct connect analog cameras and an unlimited number of IP camera sources depending on selected model.

6. The VMS shall have the ability to write to DAS, NAS iSCSI and Fiber SAN in addition to local storage. The VMS storage volume can be configured to write to RAID levels 0, 1, 5, 6, 10, 50 and JBOD.

7. The VMS shall support all leading industry-standard compression formats including Motion JPEG, MPEG-4, H.264, & H.265.

8. The VMS shall simultaneously handle recording, archiving, retrieving, playback and live distribution of video and audio. The software shall operate in a continuous recording mode or according to a programmed time/date schedule. Recording functions may also be triggered by events and motion detection.

9. Live and archived video/audio data shall be available to authorized users at anytime over local or wide area network connections.

10. The VMS shall incorporate a Web Client so live and recorded video may be viewed via the Internet by authorized users.

11. The VMS shall incorporate a Mobile Client so live and recorded video may be viewed via the Internet by authorized users.

12. The VMS Server software shall utilize a high performance, multi-threaded, application engine. This allows multiple tasks to be executed at the same time and is required to take full advantage of multiple core or multi-processor technology.

13. The VMS software shall utilize a camera abstraction layer. Video shall be captured in such a way as to provide seamless support of multiple, disparate video source technologies transparent to the user and allowing for the integration of new capture technologies as they become available.

14. The VMS shall provide direct support of IP-based video sources in such a way that the use of camera manufacturer supplied COM application software interfaces such as ActiveX controls are not required.

15. The VMS shall provide a Video Proxy capability allowing for a designated server to be a single point of client connection requests for video recording to any of multiple Recording Servers.

16. The VMS shall support QuickTrack recording allowing a user to custom record a series of cameras being focused on. This provides the ability to record the cameras of interest when tracking a suspect across multiple cameras.

17. The VMS shall be capable of integrated operation with other security related systems such as Access Control Systems (ACS), Central Station Monitoring Systems (CSMS) and Video Analytics Systems (VAS) or applications. Integrated manufacturers at time of publication of this specification include:

    ACS Products

    a. AMAG
    b. Apollo
    c. Continental Access
    d. DSX
    e. Identicard
    f. Maxxess
    g. Precision Edge Access Control, Inc. (formerly Novus Edge)
    h. Open Options
    i. S2 Security
    j. Software House (CCURE 9000)
    k. Red Cloud
    l. RS2
    m. Lenel OnGaurd
    n. Vanderbilt
    o. Feenics
    p. Frontier by Matrix

VAS Products

a. Mango / Mate
b. Axis
c. AMAG
d. Bosch
e. Hikvision
f. SightLogix
g. Samsung/Hanwha
h. Video IQ
i. Vivotek

CSMS Products

a. Bold Manitou
b. SureView Immix
c. IDV Solutions

(NOTE: The list of integrated ACS, CSMS and VAS products is expanding rapidly. Please check with Salient for the latest listings.)

C. 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, add-on features or other license fees. The licensing program characteristics are:

1. IP camera license shall not be tied to a hardware address (MAC Address).

2. The VMS Server software shall not be tied to the 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 can be installed an unlimited number of times and may be running simultaneously without additional licensing cost.

5. Licensing for directly connected analog cameras shall include for no additional cost, PCI or PCIe, connected encoding hardware. The VMS manufacturer shall allow for trade in or conversion of the encoding hardware for the equivalent number of IP camera licenses in the future allowing the user to switch from analog cameras to IP cameras without incurring additional licensing cost.

2.3 SYSTEM HARDWARE REQUIREMENTS

(Refer to Section 28 05 19 Storage Appliances for Electronic Safety and Security *and* Section 28 21 00 Video Surveillance Includes: video surveillance cameras and supporting hardware and video management systems.)

A. VMS System Host:

1. The VMS host server shall be a standalone or integrated product from a recognized industry leader including internal or external storage arrays.

2. Storage capacity and configuration shall be scalable based on specific application needs without modification to the base VMS software package.

3. The hardware may be supplied by the VMS manufacturer, an integrator certified by the VMS manufacturer or by the client IT Team.

4. All hardware platforms will be capable of mounting in a standard nineteen inch (19”) equipment rack and accepting power, network and other standard IT wiring connections.

B. Minimum hardware requirements

1. The VMS manufacturer shall provide an online HTML based tool to calculate hardware requirements for a specific recording configuration managed by the VMS server.

C. IP Cameras

The VMS manufacturer shall periodically test various IP cameras to insure compatibility. Check with the VMS manufacturer for a comprehensive list of supported camera models. The following camera and encoder manufacturers have been tested and have models compatible with the VMS:

a. ACTi
b. American Dynamics
c. Appro
d. Arecont
e. Axis Communications
f. Bosch
g. Basler
h. Canon
i. Cisco
j. HikVision
k. IQeye
l. Lumenera
m. Mobotix
n. OpenEye

o. Panasonic
p. Pelco
q. PSIA (Honeywell)
r. Scallop
s. SmarterCam
t. SightLogix
u. Sony
v. Toshiba
w. Vivotek

(NOTE: The list of integrated camera products is expanding rapidly. Please check with Salient for the latest listings.)

D. Analog Cameras

1. Up to 64 analog cameras can be directly connected to a server via coaxial cables and standard BNC connectors. No IP encoder is required.

2. The integrated analog inputs shall support the following video resolutions:
   a. 160 x 120 pixels NTSC
   b. QVGA (320 x 240 pixels NTSC)
   c. Field Mode (640 x 240 pixels NTSC doubled to 640x480)
   d. VGA (640 x 480 pixels NTSC)
   e. SECAM shall also be supported.

2.4 SYSTEM SOFTWARE CHARACTERISTICS

A. Recording Servers

The VMS Recording Server component shall have the following characteristics and features:

1. Video servers shall be capable of supporting an unlimited number of IP cameras.

2. IP cameras may record up to 11 mega-pixel resolution per camera sensor.

3. Video inputs may be recorded up to 30 Frames Per Second (FPS).

4. VMS Server shall be capable of interfacing with MJPEG, Microsoft MPEG-4, ISO MPEG-4, H.264, & H.265 compressions.

5. VMS Server shall record native camera format or transcode video to any supported format.

6. Recorded video shall be tamper evident. Video recordings shall be marked with an electronic watermark. The electronic watermark shall be generated using an MD5 Hash algorithm.

7. Separate, programmable event and motion detection settings shall be provided per video input.

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

9. The VMS Server shall maintain full VMS functionality regardless of the user rights of a locally logged-on Windows user.

10. 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.

11. 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.

12. The VMS server shall store video events as a user accessible file within the NTFS file system without requiring the user or administrator to extract the video event from an image database or other proprietary storage database for purposes of archive or review.

13. The VMS shall operate using “Client/Server” architecture with no central video streaming server required.

14. The VMS shall be compatible with IT backup software and not require a proprietary “archiving” function for management of stored video files. Compatible IT backup software shall include these features:
    a. Locked file support
    b. Ability to duplicate files and folders
    c. Backup without encryption and compression
    d. Delete original files after backup

15. The VMS shall include a built-in archiving feature for the purpose of moving recordings from their original storage volume to a different local or network-attached storage volume on an administrator-defined schedule. The VMS shall be capable of separately archiving video marked as motion recordings, external alarm recordings and scheduled recordings or any combination of those types.

16. The VMS shall provide a stable recording environment via a modular video storage and data management architecture to minimize common database corruption situations. Video and audio storage shall be stored outside of a database in a flat file structure. This reduces the potential of video/audio data corruption and allows rapid database rebuilding with no restart required in the event of system failure.

17. The VMS shall provide “Dynamic Resolution Scaling” to minimize bandwidth sent to displays for either live or recorded video. While video sent from the camera is recorded in its original resolution, the server automatically resizes the video stream sent to the display based on the size of the display window. The viewing pane can be resized at any time and the server will automatically adjust accordingly with no user intervention required to adjust the video stream. This provides for the lowest possible bandwidth consumption without sacrifice of display quality.

18. The VMS shall provide “Dynamic Video Decoding” to intelligently decide when server-side processing of video streams is necessary. Dynamic Video Decoding shall enable video processing dynamically when users begin live viewing video streams, to enable Dynamic Resolution Scaling, or when server-side motion detection is used or when the user requests other system features requiring server side processing of video streams.

19. The VMS shall provide “Dynamic Frame Throttling” which allows the VMS to dynamically toggle the number of frames streamed to clients live-viewing video when the NVR is under heavy processing load. Dynamic Frame Throttling will prevent video latency under heavy NVR processing conditions.

20. The VMS shall provide an “On-Demand” camera streaming feature, whereby the VMS will deliver video output from the selected camera only when live viewing is requested by a VMS client with the intent of overall network bandwidth use reduction. On-Demand camera configuration shall support low, medium, and high resolutions over any FPS setting.

21. The VMS Client and Server applications scale to any number of cameras and servers as required.

22. There shall be no imposed limit on the scalability of the system. The VMS system shall be expandable by adding additional video servers and storage devices to support increased camera capacities.

23. 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:

a. Display live camera views.
b. Perform video archive search and retrieval functions.
c. Control pan-tilt-zoom cameras.
d. Add/Modify/Delete user accounts.
e. Initiate recording of external alarm events.
f. Modify a subset of the server configuration.

B. Management Server

The VMS shall 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. The VMS shall 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.

1. The Management server shall centrally store VMS client configuration. When a user of the VMS client logs in, their configuration is downloaded to the workstation they are using. This allows them to maintain their configuration when logged into any workstation running VMS client software.
2. The Management Server shall provide the system administrator 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.
3. The administrator shall have the ability to push software updates to Recording Servers remotely
4. The Management Server shall support the copying and/or moving of cameras between Recording Servers
5. Management Server shall be installable as a Windows System Service so full Management Server functionality is maintained even if a Windows user is not logged in to the operating system.

C. Desktop Client

The VMS shall provide a Desktop Client software component, wherein all configuration, live viewing, playback, maintenance, alarm, and system monitoring functions shall be accessible by authorized users from within one, unified interface.

1. There shall be no software-imposed limitations on the number of clients installed.

2. The client shall utilize either application specific credentials or integrate with Active Directory for authentication.

3. The configuration of the appearance and functionality of the client shall be customizable and follow the user from workstation to workstation.

4. The client shall offer manual selection of supported localization from the initial login screen.

D. Recording Server Configuration

Configuration of VMS Recording Servers and VMS client users is performed in the Configure application from within the Desktop Client. The application can be run from any network connected workstation and used to perform configuration of multiple Recording Servers (simultaneously) or clients.

1. 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. The following functions shall be included to reduce configuration time.
   a. The administrator shall be able to clone users and/or groups to reduce redundant configuration.
   b. The administrator shall be able to clone IP camera configuration to reduce redundant configuration.
   c. The administrator shall be able to clone recording schedule to reduce redundant configuration.

2. The VMS shall 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.

3. The VMS shall allow configuration of the following server information:
   a. Server name; TCP port numbers used for client/server communication; Embedded Web server enable and HTTP port, etc.
   b. Shall Import Active Directory and Lightweight Directory Access Protocol (AD/LDAP) users and groups.
   c. Which events are to be kept in server logs.
   d. E-mail configuration information for camera alarm notifications.
   e. Administration of Feature Keys associated with the system.

4. The VMS shall support an unlimited number of Users/Groups. Controls shall include:
   a. AD/LDAP shall be supported to allow importing of users groups existing elsewhere on the network.

b. Administration of both groups and users including viewing/modifying server configuration; logging of events such as login, logout, playback requests, live view requests, etc.
c. User camera permissions including enable view, enable playback (with or without export capability), enable Snapshot, enable PTZ control, number of presets allowed per camera and PTZ priority.
d. 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 will gain control.

5. The VMS shall allow the administrator to define video archival volumes. A single or multiple recording volumes may be configured for each server.
   a. The user shall be able to specify the location of the video recording volume. A volume can be defined as any drive letter and folder path on the server's direct attached, mapped or iSCSI storage or any UNC path. This allows for defining a volume as C:\Video\ or \\StorageServer\Video.
   b. Volumes can be marked as "Regular", "Archive", "Backup," "Export," or "Readonly". Each volume can be associated to one or more cameras managed by the Recording Server.
   c. The location of recordings across the volumes shall be tracked automatically by the VMS server so a user searching for video shall not need to specify the recording's location on disk.
   d. The administrator may define the minimum free space on the volume which recordings cannot be written to.
   e. Video shall be written to the volume in a First-In-First-Out (FIFO) method to volumes marked as "Regular", "Archive," or "Backup". When the volume has reached its maximum allowed space the oldest day of recordings is deleted in order to free space for new recordings.
   f. In the event multiple volumes are marked as "Regular" and associated to the same camera, new video will be written to the next "Regular" volume when the current "Regular" volume reaches the maximum allowed space.

6. The VMS shall allow the administrator to define archive storage volumes. The VMS shall move video from a "Regular" volume to the "Archive" storage volume on an administrator-defined schedule. A single or multiple archive storage volumes may be configured for the server.
   a. The user shall be able to specify the location of the archive storage volume. An archive volume can be defined as any drive letter and folder path on the server's direct attached, mapped or iSCSI storage or any UNC path. This allows for defining a volume as C:\Video\ or \\StorageServer\Video.
   b. Multiple archive storage volumes can be defined for each Recording Server.

c. The user shall be able to specify the number of days to keep archived recordings for before deletion from the archive storage volume. This can be separately specified for each archive storage volume defined.
d. The user shall be able to specify the minimum free space on the archive storage volume which recordings cannot be written to.
e. The administrator shall be able to associate an “Archive” volume to a single or multiple “Regular” volume. Each “Regular” volume will automatically move the oldest video to the associated “Archive” volume in order to free space for new recordings. Each “Regular” volume can be configured with an independent schedule with the following parameters:
    i. The administrator shall be able to define the maximum number of days to store video for before being moved to the associated archive storage volume.
    ii. The administrator shall be able to define the number of days between archiving events.
    iii. The administrator shall be able to define the time of day for the archive event to begin.

7. The VMS shall allow the administrator to define backup storage volumes. The VMS shall copy video from a “Regular” volume to the Backup storage volume on an administrator-defined schedule. A single or multiple backup storage volumes may be configured for the server.
    a. The user shall be able to specify the location of the backup storage volume. A backup volume can be defined as any drive letter and folder path on the server’s direct attached, mapped or iSCSI storage or any UNC path. This allows for defining a volume as C:\Video\ or \\StorageServer\Video.
    b. Multiple backup storage volumes can be defined for each Recording Server.
    c. The user shall be able to specify the number of days to keep backup recordings for before deletion from the backup storage volume. This can be separately specified for each backup storage volume defined.
    d. The user shall be able to specify the minimum free space on the backup storage volume which recordings cannot be written to.
    e. The administrator shall be able to associate a “Backup” volume to a single or multiple “Regular” volume(s). Each “Regular” volume will automatically copy the oldest video to the associated “Backup” volume in order maintain a duplicate set of files of the recorded video. Each “Regular” volume can be configured with an independent schedule with the following parameters:
        i. The administrator shall be able to define the maximum number of days to store video for before being copied to the associated backup storage volume.
        ii. The administrator shall be able to define the number of days between backup events.

iii. The administrator shall be able to define the time of day for the backup event to begin.

8. The VMS shall provide the following configurable individual camera parameters for all cameras:
   a. Enabled. If disabled no recording will take place regardless if recording is enabled elsewhere in the system (e.g., schedule).
   b. Name.
   c. Resolution which sets the capture resolution (e.g., 640x480).
   d. Video Compression. Selectable from MJPEG, MPEG-4, H.264, & H.265.
   e. Time Stamp Overlay imposes the date and time in in a selectable location of the video input.
   f. Camera Name overlay imposes the camera name in a selectable location of the video input.
   g. Time stamp imposes the camera time in a selectable location of the video input.
   h. Stream properties imposes the camera's streaming properties in a selectable location of the video input.
   i. Analog cameras can be defined as color or black & white.
   j. Continuous Recording sets the video recording frame rate for scheduled, continuous recording.
   k. Alarm Recording sets the video frame recording rate for external alarm events.
   l. Motion Recording sets the video recording frame rate for motion detection events.
   m. The Analog Settings panel 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.

9. The VMS shall provide a camera search and add tool for automatically detecting cameras and adding individual or groups of cameras. The auto detection tool shall have the following capabilities
   a. Detection of cameras via Universal Plug and Play (UPnP).
   b. Allow for adding cameras detected to the VMS configuration for recording.
      i. The tool shall allow for groups of cameras to be added or individual cameras.
      ii. Prior to a camera being added the tool shall check to see if a video stream can be acquired preventing misconfigured camera from being added.
10. The VMS shall provide automated, e-mail notification to one or more recipients when certain alarm events occur on a per camera, volume, or

server basis. The VMS provides control of the following parameters upon which an e-mail may be sent:

a. Event type which 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.
b. 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.
c. E-mail subject and recipient list. Multiple recipients' addresses may be specified.
d. Notification limits shall be configurable specifying the maximum number of emails which can be sent for an individual event and the minimum time between events.

11. IP Camera configurations shall be configured specifically for each IP camera. Configuration options shall include:
    a. Camera manufacturer and model. Used to specify the communication driver for the IP camera or encoder.
    b. Camera address which can be specified as an IP address.
    c. Camera ID used to specify the camera number when using a multi port encoder.
    d. Communication port numbers such as HTTP or RTSP port
    e. Camera username and password.
    f. Compression type (MJPEG, MPEG4, H.264, & H.265). Compression type is dependent on the camera manufacturer and model chosen.
    g. The VMS shall 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).
    h. The VMS shall 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.

12. The VMS shall provide a Generic (universal) driver for IP cameras and encoders not available in the supported camera list.
    a. The generic driver shall be able to pull individual JPEG snapshots at a configured interval via HTTP protocol.
    b. The generic driver shall be able to pull a standard Motion JPEG stream via HTTP protocol.
    c. The generic driver shall be able to pull a standard MPEG4 stream via RTSP over HTTP protocol.
    d. The generic driver shall be able to pull a standard MPEG4, H.264, or H.265 stream via RTSP/UDP.

e. An Image Path parameter allows the administrator to specify the URL location of the JPEG snapshot, Motion JPEG stream or RTSP stream.

13. The VMS shall provide configuration support for Axis Communications, Arecont, AMAG Symmetry, Bosch, Hikvision, Samsung, SightLogix, VideoIQ & Vivotek camera-based event notification. The list of supported manufacturers for camera-based events is always growing. Contact Salient for the latest list.

14. The VMS shall include a recording schedule planner that allows the setting of a recording schedule. Multiple schedules may be configured and each camera may have a unique recording plan within the schedule.
    a. The VMS shall allow for the configuration of multiple schedules.
    b. The VMS shall allow for a schedule to be run on a specific date, run on all weekdays, run on all weekends or to run every day.
    c. The VMS shall allow for configuration of a unique recording plan for each camera within the schedule. The recording plan shall specify what types of recording should occur for each camera in a 24 (twenty four) hour period.
        1. Scheduled recording, motion recording, alarm recording and pre-alarm recording shall be configurable recording types within the recording plan.
    d. 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.
    e. The VMS shall allow for configuration of scheduled, alarm, motion and pre-alarm recording separately or allow combinations of those recording types to occur at the same time.
    f. Camera recording plans shall allow the administrator to configure recording times down to 1 (one) minute increments.
    g. The VMS shall allow the administrator to "copy and paste" individual camera recording plans to other cameras to reduce configuration time.

15. The VMS shall 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.
    a. The VMS shall allow for a preset schedule to be run on a specific day, run on all weekdays, run on all weekends or to run every day.
16. The VMS configuration tool shall support diagnostic and system reporting features.
        a. 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.

b. 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.

17. The VMS shall support integration with 3rd party NVR or DVR devices.
    a. The VMS shall support Hikvision and Samsung/Hanwha brand NVRs.
    b. The VMS shall support live video streaming, PTZ camera control & date & time based playback from the 3rd party NVR.

E. Client Configuration

View layout and map configuration are controlled through the Configure tool from within the Desktop Client by authorized users. Client configuration is stored centrally and accessible from any network connected workstation.

1. The Configure tool shall allow for the 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.
    a. The Configure tool shall allow for the creation of a new user / group. AD/LDAP shall be supported to allow importing of users and groups existing elsewhere on the network.
    b. The Configure tool shall support automatic startup of the various tools (Live View, Dashboard, etc.) located within the Desktop Client application.

2. The Configure tool shall allow the administrator to configure 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.
    a. Sites shall be able to contain View Layouts and Maps.
    b. The VMS shall have no software imposed limit to the number of sites which can be configured.
    c. Each site shall have a customizable name, allowing for easy identification of what the structure represents.
    d. 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.

3. 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.

4. 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 setup for viewing on a target display in configurable grid arrangements.
    a. View layouts shall have no software imposed limitation on the number of cameras which can be viewed per target monitor.
    b. 4 x 3 or 16 x 9 (widescreen) or 9 x 16 target displays shall be supported
    c. 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.
    d. 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.
    e. 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.
    f. View layouts can be optionally added to a sequence with a configurable dwell time (in seconds).
    g. The video tiles shall be capable of containing maps.

5. The Configure tool shall allow for the setup of map based display of video. Unlimited site maps can be configured per user or group.
    a. The Configure tool shall support the import of unlimited JPEG or BMP files as maps.
    b. The Configure tool shall support the use of online satellite imagery for map usage, provided Internet connectivity on the Recording Server.
    c. The Configure tool shall support unlimited cameras per map.
    d. Maps can be hyperlinked. Maps may be hyperlinked to unlimited levels.
    e. 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.
    f. A live image from the target camera shall be displayed on mouseover for easy identification of camera position and field-of-view
    g. Each camera can be configured with a cone representing the camera’s field-of-view. Cone angle, width and length may be controlled.
6. 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.

F. 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:

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1. The VMS shall provide simultaneous recording, live view, playback and export of video.

2. The system shall be capable of displaying any number of live cameras concurrently per monitor. Video can 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.
   a. The VMS shall provide unlimited, customized viewing layouts per user.
   b. The VMS shall have the ability to display view layouts organized in a hierarchy of Zone and Site folders.
   c. VMS Live View shall support widescreen or standard displays in both 4 x 3, 16 x 9 and 9 x 16 aspect ratios.
   d. The system shall support 16 x 9 aspect ratio cameras, 4 x 3 aspect ratio camera and 9 x 16 aspect ratio camera sources.
   e. The VMS shall be capable of displaying tiled video views in full screen mode and filling the entire screen.
   f. The VMS shall be capable of displaying a single camera full screen when the user double clicks the associated video tab.
   g. VMS Live View shall provide full screen on demand.
   h. Provide custom display size for each camera individually.
   i. Allow changing view layouts via “dragging and dropping”.
   j. VMS Live View shall limit access to view cameras user by user.
   k. VMS Live View shall provide adjustable frame rates individually by camera.
   l. VMS Live View shall provide 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.
   m. The user shall be able to change view layouts by clicking the desired administrator or individually configured view layout in the tree-view. The user shall be able to enter sequence mode where the VMS Live View automatically switches between view layouts at preconfigured dwell times.

3. The VMS Live View shall be capable of displaying maps within a video view layout.

a. 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.

4. The VMS Live View shall provide 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.
   a. VMS Live View shall provide control of PTZ speed.
   b. VMS Live View shall allow enable/disable of automated PTZ tours.
   c. VMS Live View shall provide manual control of camera Iris, Focus, Auto Iris and Auto Focus.
   d. VMS Live View shall provide access to view any PTZ preset location if authorized.
   e. VMS Live View shall provide access to set PTZ preset location if authorized.

5. The system shall include “quick review” 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.

6. The VMS Live View shall provide access to a mapping interface.
   a. Maps can be displayed full screen on demand.
   b. VMS Live View shall provide controls to toggle the display of map hyperlink and camera labels.
   c. VMS Live View shall provide controls to adjust the zoom level of the map.
   d. VMS Live View shall provide a live video pop up window when a user hovers the mouse over a camera icon.
   e. VMS Live View shall provide a pop up window with live video and PTZ controls when a user double clicks the camera icon.
   f. VMS Live View shall display preconfigured field-of-view cones representing the cameras position and field-of-view.
   g. Field-of-view cones shall change color indicating motion events, external alarm events, camera status, and recording status.
   h. The 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.
   i. The VMS Live View shall have the ability to display maps organized in a hierarchy of sites.

7. The system shall provide 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.

8. The VMS Live View shall support Dynamic Resolution Scaling.

G. Recorded Video Playback and Search

The Desktop Client application shall provide a comprehensive set of search tools for the investigation of security events.

1. The VMS Playback application shall provide single camera playback that includes:
   a. Playback clips from any camera on any server.
   b. Search by date/time.
   c. Video clips are color coded to indicate motion, event or scheduled recording.
   d. 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.
   e. Playback controls shall include play, pause, rewind, fast-forward, frame advance, frame reverse, next clip, previous clip, and I-Frame only playback.
   f. VMS Playback application shall provide adjustable playback of up to 1600% of original speed.
   g. VMS Playback application shall allow for export of clips to thumb drive or any location on disk.
   h. VMS Playback application shall allow taking of a snapshot that may be digitally zoomed, saved, printed, etc.
   i. Snapshot shall include “smooth zoom” feature to significantly reduce pixilation introduced by digital zooming.
   j. 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.

2. The VMS Playback application shall provide an Export Queue which allows for central access of “bookmarked” video clips.
   a. VMS Playback application shall allow multiple clips to be added to the export queue.
   b. VMS Playback application shall allow for unique text descriptions of each video clip.
   c. VMS Playback application shall allow for export of all video clips in the queue to thumb drive or any location on disk.

3. The VMS Playback application shall support multi-camera playback that includes:
   a. Playback video from up to sixteen (16) cameras simultaneously.

b. VMS Playback application shall support playback of cameras from a single or multiple Recording Servers.
c. VMS Playback application shall provide a color coded bar graph showing when and what types of recordings are available from each camera.
d. VMS Playback application shall provide standard playback controls including play, pause, rewind, fast-forward, frame advance, frame reverse, next clip and previous clip.
e. VMS Playback application shall provide adjustable playback of up to 1600% of original speed.
f. VMS Playback application shall allow taking of a snapshot that may be digitally zoomed, saved, printed, etc.
g. Recordings may be exported with an optional executable player that allows for verification that no tampering has occurred during the copy and export process.
    a. The VMS Video Player shall have the ability to playback between one (1) and sixteen (16) exported video clips simultaneously.

4. The VMS Playback application shall provide a thumbnail search capability allowing users search recorded video by viewing a series of thumbnail images between a defined timeframe.
    a. VMS Playback application shall support displaying up to 36 thumbnails between the defined time rage of the search.

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.

5. VMS Playback shall support Dynamic Resolution Scaling.

H. Pan-Tilt-Zoom (PTZ) & Fisheye Camera Controls

1. The VMS shall provide the ability to control one (1) or more PTZ cameras using either analog or IP protocols. The following control protocols are supported at the time this specification was published:

ANALOG Protocol:

1. American Dynamics ASCII Continuous
2. American Dynamics Make/Break
3. AD Pelco P
4. Canon VCC-4
5. Kalatel
6. Digital CompleteView
7. Panasonic WV-CS850 Conventional
8. Panasonic WV-CS850 New
9. Pelco ASCII

10. Pelco D
11. Pelco P
12. Philips Biphase
13. RVision
14. SAE
15. Samsung
16. Sensormatic
17. Sony VISCA EV1-D30/D31
18. Ultrak K6 (Diamond)
19. VCL
20. Vicon

IP Protocol:

21. ACTi HTTP IP
22. ACTi Pelco D IP
23. ACTi Pelco P IP
24. AD Illustra
25. AD
26. Axis V2 IP
27. Axis V2 IP V 4.0
28. Bosch BiCom
29. Bosch OSRD
30. Bosch Pelco D
31. Brickcom
32. Canon
33. Cisco IP
34. Dahua IP
35. Digital
36. FLIR
37. Generic-D
38. Hikvision Speed Dome
39. Mobotix IP
40. Panasonic IP
41. Pelco API
42. Pelco
43. Samsung
44. Samsng IP v.2
45. Sony IP Continuous Move
46. Sony IP Move
47. Sony P5 IP
48. Sony VISCA IP
49. Speco IP
50. Symmetry ENVS IP
51. Toshiba IK-WB IP
52. Toshiba IK-WB21A IP
53. Vivotek

360 Dewaraping:

54. ACTi
55. Axis Communications
56. Immervision
57. Hikvision
58. Oncam Grandeye
59. Sentry 360
60. Vivotek

2. The VMS shall be able to digitally Pan Tilt and Zoom any fixed camera using the same PTZ controls used for mechanical PTZ cameras.

3. The VMS shall be capable of automatically returning a PTZ camera to its specified Home position after a configurable period of inactivity.

4. The VMS shall be capable of controlling 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.

5. The VMS software shall be capable of configuring 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:
   a. Up to 100 preset locations.
   b. 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.
   c. Enabled automatically or disabled on VMS startup.

6. Users shall have the ability to configure names for preset positions.

7. The VMS shall be capable of automatically stopping a preset tour when a user attempts to control the camera.

8. The VMS shall be capable of automatically restarting the tour after a configurable period of inactivity.

9. The VMS shall provide an "Automated Attendant" feature. This 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:
   a. The system can give “high priority” status to important locations so the view is maintained despite activity in lower priority areas.
   b. Provide 10 (ten) motion zone priority levels.
   c. Adjustable Hold Time prior to responding to a lower priority alarm.
   d. Adjustable Dwell Time before cycling to a motion alarm with the same priority.
   e. Zone Cycling which, when motion detection is detected in multiple zones with the same priority level, will alternate between the alarmed presets.
10. The VMS shall provide integration with client-side dewarping with the following list of manufacturer’s 360/Fisheye cameras:
    - Immervision
    - Sony
    - Brickcom
    - Samsung
    - Vivotek
    - Sentry 360
11. The VMS shall provide integration with camera-side dewarping with the following list of manufacturer’s 360/Fisheye cameras:
    - Axis
    - ACTi
    - Mobotix
    - Arecont
12. The VMS shall support the ability to save camera positions from supported fisheye camera with client-side dewarping. Camera positions shall be configurable by the system user.

I. Motion Detection/External Alarms Capabilities

The VMS Recording Server and Configure tools shall provide a comprehensive set of tools for handling security alarms. The following features shall be available:

1. Motion detection shall provide multiple, configurable detection windows in the field-of-view.

2. The VMS shall allow the user to set the zones (areas) that the video motion detection engine should analyze for movement. The VMS shall provide control of the following parameters:
   a. New Zone adds a new zone to be configured via the mouse.
   b. Erase Zone removes a selected single zone.
   c. Erase All deletes all zones.

3. Motion detection shall be programmable with variable sensitivity levels via a slider.

4. External alarms shall trigger alarm recording. External alarm sources available include but are not limited to:
   a. Alarms from supported Video Analytic Systems.
   b. Alarms from supported Access Control Systems.
   c. Alarms from I/O devices. *[contact Salient for list of supported devices]*
   d. Alarms from supported IP Cameras and Encoders.

5. The VMS shall allow the administrator the ability to program settings which control the software motion detection and external alarm recording behavior of the VMS. The VMS shall provide control of the following parameters:
   a. Pre-alarm/Pre-motion(s) shall set the number of seconds to capture video prior to the start of a video motion or external alarm event. Pre-alarm recording is selected in 5 second increments and is programmable from 0 seconds to 120 seconds prior to the alarm event.
   b. The VMS shall provide separate configurable post alarm or post motion event recording times. The post motion and post alarm settings are selected in 1 second increments and is programmable from 0 to 60 seconds after the motion or alarm event. The VMS shall provide a configurable Motion Sensitivity setting which selects the sensitivity level of the motion detection engine for the selected camera. The 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.

6. The VMS shall provide tools for the automatic control of a PTZ camera on motion or alarm event.
   a. On motion detection 1 or more PTZ preset positions may be shown across 1 or more cameras.
   b. Each motion window shall have an individual list of PTZ movements to control on event.
   c. Each motion window may control multiple separate PTZ cameras.
   d. There shall be no software imposed limit on the number of preset positions that can be controlled on a motion event.
   e. 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.
   f. The administrator shall be able to select whether Motion Zone actions take place only on the motion detection recording schedule or all the time.
   g. On PTZ capable cameras the camera may be directed to a preset position on alarm event prior to alarm recording.

7. The VMS shall provide a "CV GeoView" 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.

J. Input/Output Devices

The VMS shall 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:

1. The VMS shall provide 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 may be controlled:
   a. Device Model allows selection of the specific device model.
   b. Address (IP) provides the IP address for the selected device.
   c. Username provides the username that the server will use to contact the device.
   d. Timeout controls how long, in seconds, the VMS should wait for a response to an initial HTTP request.
   e. Retries controls how many times the VMS should attempt to connect to the IP camera before declaring it unreachable.

2. The VMS shall 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:
   a. Each input can trigger recording on a single or multiple cameras.
   b. Multiple inputs can trigger recording on the same or different cameras.
   c. Alarm event triggers can occur when an input is closed or open, based on administrator configuration.

3. The VMS shall provide automatic control of the outputs associated with the I/O device. The following features shall be available:
   a. The output may be set to close or open on event.
   b. 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.
   c. It shall be possible for the administrator to associate events from multiple cameras for automatic triggering of the output.
   d. 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.

K. Audio Recording

The VMS shall be capable of recording audio with video through the use of VMS manufacturer supported audio capture adaptors (check with manufacturer for currently supported devices). Additionally the VMS shall be capable of

capturing audio directly from supported IP cameras. The following features shall be available:

1. The VMS shall allow an audio stream to be assigned to an analog or IP video channel. The following parameters may be controlled:
   a. Enable Audio attaches an audio stream to a selected video source.
   b. Audio Source specifies which audio device to use.
   c. Channel allows assigning of either right or left audio channel if Split Channels audio mode is selected. This feature enables a single stereo audio input to provide two separate channels when using the appropriate adapter.

2. The VMS shall allow independent control of each audio capture adaptor device properties. The following parameters may be controlled
   a. Capture Quality is selectable from low, medium and high.
   b. Channel Mode selects the operation mode of the audio input from Mono, Stereo and Split Channels.

3. The VMS shall capture audio from supported IP cameras and encoders.
   a. The VMS shall capture audio synchronized with the video when recorded with MPEG4, H.264, & H.265 video streams.
   b. The supported audio format shall be G.711 µ-Law.
   c. The supported capture protocol shall be RTSP over HTTP or RTSP over UDP.

L. Alarm Video Monitoring

The VMS shall be capable of displaying video only when an alarm condition is present through the VMS Alarm Client. 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.

1. The VMS Alarm Client shall display video from associated cameras on an external alarm event and/or motion detection event.

2. The VMS Alarm Client shall 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.

3. Multiple cameras may be associated with the VMS Alarm Client for monitoring. There shall be no software imposed limit to the number of cameras which can be monitored.

4. The VMS Alarm Client 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.

5. Cameras from a single or multiple Recording Servers may be monitored simultaneously in the VMS Alarm Client.

6. There shall be no software imposed limit on the number of cameras which can be monitored by a single instance of the VMS Alarm Client. There shall be no software imposed limit on the number of VMS Alarm Client which can operate simultaneously on a single workstation.

7. The VMS shall maintain a log of the last 500 alarm events.

M. Pop Up Event Notification

The VMS shall be capable of displaying 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.

7. The VMS SpotLight application shall display video from associated cameras on an external alarm event and/or motion detection event.

8. The VMS SpotLight application 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.

9. Multiple cameras may be associated with the VMS SpotLight application for monitoring. There shall be no software imposed limit to the number of cameras which can be monitored.

10. Cameras from a single or multiple Recording Servers may be monitored simultaneously in the VMS Alarm Client.

11. Multiple monitors shall be supported and the VMS SpotLight application shall be configurable so the user can select which monitor and corner of the screen to display video popup windows in.

12. 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.

13. The VMS SpotLight application 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.

14. The VMS SpotLight application 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.

15. The VMS SpotLight application 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.

N. Remote Web Video Monitoring

1. The VMS shall allow authorized users to remotely view live video, playback recorded video and export video via Firefox, Chrome, or Edge browsers.
    a. The VMS web client shall use HTML5 for cross platform compatibility and live streaming MJPEG support.

2. The VMS web client shall allow for live streaming and streaming of recorded video in MJPEG format.

3. The VMS web client shall provide supported localized experience.

4. The VMS web client shall support Dynamic Resolution Scaling of video for both live and recorded video streaming.

5. 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.

6. The VMS web server shall allow for HTTP and HTTPS connections.

7. There shall be no software-imposed limitation on the number of simultaneous connections to the Web Client.

8. Log-in and authentication is required when connecting to the system.

9. The VMS Web Client shall provide playback features which include:
   a. Playback of a single camera.
   b. Search by date/time.
   c. 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.
   d. Video clips can be filtered by recording type. Users can specify viewing only motion, external alarm or scheduled recordings, or any combination of those types.
   e. Standard playback controls shall include play, pause, rewind, fast-forward, frame advance, frame reverse and a scrub bar to control the playback position.
   f. The playback window size can be scaled by user controllable buttons to a larger or smaller size.
   g. The VMS web client shall provide adjustable playback speed to play back video.
   h. Shall allow for export of clips to thumb drive or any location on disk.
   i. Shall allow taking of a snapshot that may be to thumb drive or any location on disk.
   j. The VMS web client shall allow for playback of cameras from a single NVR or multiple NVRs.

10. The VMS Web Client shall provide extensive live viewing functionality to include:
    a. Switch viewing among multiple live camera layouts (single and multiple cameras).
    b. Any view layout shall support displaying video from a single or multiple NVRs simultaneously.
    c. The live view layout size can be scaled by user controllable buttons to a larger or smaller size.
    d. The VMS 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.

11. The VMS Web Client shall provide Pan Tilt and Zoom camera controls that include:
    a. PTZ camera movement can be controlled by control buttons (Up, Down, Left, Right, Up Right, Up Left, Down Right, Down Left, Zoom in & out).
    b. PTZ preset positions can be set or shown by the user (provided they have been granted permission to access the preset positions).
    c. PTZ camera speed can be controlled.

O. Mobile Device Video Monitoring

1. The VMS shall be compatible with client viewing applications available for Android, iPhone and iPad platforms.

2. The VMS mobile client shall support viewing of live video via multiple view layouts.

    a. The VMS mobile client shall support displaying multiple, individually configured, view layouts in both portrait and landscape viewing modes.
    b. The VMS mobile client shall support streaming audio on audio-enabled cameras.

3. The VMS mobile client shall support playback of recorded video.

    a. VMS Recording Server, camera, date & time of the recording and recording type (motion, scheduled and alarm) shall be searchable or filterable criteria
    b. The VMS mobile client shall provide a scrub bar control to provide a means of quickly moving through the recorded clips.
    c. The VMS mobile client shall support adjustable playback speed, rewind, skip to beginning/end of clip, pause and play controls for playback of recordings
    d. The VMS mobile client shall support playback of recorded audio.

4. The VMS mobile client shall support Dynamic Resolution Scaling, which requires the VMS Recording Server to transmit only the resolution necessary to display on the mobile device, reducing the bandwidth consumed for live display of video.

5. The VMS mobile client shall support Pan Tilt and Zoom camera control.
    a. The VMS mobile client shall provide PTZ control buttons including move up, down, left, right, up left, up right, down left, down right, zoom in & out.
    b. The VMS mobile client shall support showing preset positions preconfigured on the VMS Recording Server.

P. Video Wall Monitoring

1. The VMS shall be capable of pushing and displaying tiled video feeds, View Layouts, and Maps from one or more Recording Servers to remote workstations connected to one or more monitors.
    a. The Video Wall shall be implemented via a Video Wall Agent that is presented as an option during Desktop Client installation on the workstation.
    b. The Video Wall Agent shall be configurable so as to uniquely identify the workstation.
    c. The Video Wall Agent shall uniquely identify each monitor attached to the workstation.

d. The Video Wall Agent shall be able to be started and stopped so as to make the workstation available or unavailable for display.
e. The VMS shall be able to create Walls so as to match the configuration of available workstations and monitors.
f. The Walls shall be capable of being populated by live video, View Layouts, and Maps from one or more Recording Servers.

Q. Video Proxy

1. The VMS Video Proxy shall be a Windows server service which can be a single point of Web Client connection requests for video from to any of multiple Recording Servers.
2. The VMS Video Proxy shall allow Web Client users to access video feeds recording to multiple separate VMS Recording Servers in a single web based interface.
3. The VMS Video proxy shall have no software imposed limitation on the number of users or VMS Recording Servers which can be configured and access from a single Video proxy instance.
4. The VMS Video proxy shall allow for configuration of CompleteView server users, groups and users & groups imported form Active Directory.
5. The VMS Video Proxy shall allow for per-user customization options, allowing for custom web interface branding for each user. Customizable web interface elements shall be:
    i. Page title
    ii. Header text and logo
    iii. Error message
    iv. Display of Recording Server detail.
    v. Display name of Recording Servers.
6. The VMS Video Proxy shall allow for Android and iOS (iPhone / iPad) client connection in addition to Web Client based connections.

R. Redundancy Operation

1. The VMS shall employ an N+1 failover model to implement redundancy of live and recorded video display and event management.
2. The VMS Management Server shall monitor the functionality of its servers.
3. In the event of a primary server failure, the VMS shall automatically transfer event management and recording and streaming functionality to a configured backup server.
4. The VMS shall employ shared storage to which the backup server writes data. The shared storage shall be accessible to both primary and backup servers.
5. When the primary server is either returned to functionality or replaced and configured, the VMS shall restore failed over operations from the backup server to the primary server.
6. The data written to the shared storage during failed over operation shall be accessible to the restored primary server.

7. Once failed over operation has concluded and the primary server has resumed normal operation, the backup server shall be returned to standby operation.

S. Network Bandwidth Control

1. The VMS shall allow configuration of certain communications between its components to deliver data only when requested in order to reduce bandwidth consumption across networks. Configurable elements shall be:
    i. Status enquiry period between the selected Recording Server and Management Server/Desktop Client
    ii. On-demand event notification between the selected Recording Server and Management Server/Desktop Client

T. ProxyCast

1. The VMS shall allow a single Recording Server to deliver live video from multiple Recording Servers associated with the same Management Server to remote clients in order to limit bandwidth and/or processing loads on those servers.
2. The ProxyCast server shall pull resolution and frame rate capped video from the other Recording Servers.
3. The ProxyCast server may work in conjunction with Network Bandwidth Control as configured to deliver video only on demand.

U. ONVIF Conformance

1. The VMS shall conform to the ONVIF Profile S standard, allowing communication with, configuration of, etc., other ONVIF Profile S conformant devices.
2. The VMS shall have the ability to pull multiple video streams from ONVIF Profile S conformant cameras capable of multiple stream profiles.
    a. The VMS shall allow selection and configuration of one primary and up to two secondary video streams from the same camera.
    b. The user shall assign the camera stream profile to the appropriate VMS recording type (Continuous, Motion, or Alarm).
    c. 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.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine area to receive devices and notify any adverse conditions affecting installation or subsequent operation.

B. Do not begin installation until unacceptable conditions are corrected.

3.2 PREPARATION

A. Protect devices from damage during construction.

3.3 INSTALLATION

A. Install devices in accordance with manufacturer's instruction at locations indicated on the floor drawing plans.

B. Perform installation with qualified service personnel.

C. Install devices in accordance with the National Electrical Code or applicable local codes.

D. Ensure selected location is secure and offers protection from accidental damage.

3.4 FIELD QUALITY CONTROL

A. Test snugness of mounting screws of all installed equipment.

B. Test proper operation of all VMS devices.

C. Determine and report all problems to the manufacturer's customer service department.

3.5 ADJUSTING

A. Make proper adjustment to video system devices for correct operation in accordance with manufacturer's instructions.

3.6 DEMONSTRATION

A. Demonstrate at final inspection that the VMS is functioning properly.

END OF SECTION