

Bosch Video Management system

ARCHITECTURAL AND ENGINEERING SPECIFICATION

Section 282313 – Video Surveillance Control and Management Systems

PART 2 – PRODUCTS

## Manufacturer

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B. This product shall be manufactured by a firm whose quality system is in compliance with the I.S. /ISO 9001/EN 29001, QUALITY SYSTEM.

## Video Management System General Description

1. The video management system (VMS) specified is an enterprise-class client/server based IP video security solution that provides seamless management of digital video, audio and data across an IP network. The video management system is designed to work with Bosch CCTV and ONVIF compliant 3rd party products as part of a total video security management system to provide full virtual matrix switching and control capability. The video management system consists of the following software modules: management server, recording services, configuration client and operator clients. Video from other sites may be viewed from single or numerous workstations simultaneously at any time. Cameras, recorders, and viewing stations may be placed anywhere in the IP network.
2. The VMS shall support the following recording services:
3. Bosch Video Recording Manager (Bosch VMS VRM)
4. Local Storage and Direct-to-iSCSI recording
5. Bosch Recording Station NVRs
6. Bosch Recording Station/ DiBos Version 8
7. Bosch Streaming Gateway
8. Bosch DVRs
9. The software components of the video management system can be deployed together on a single PC for small system applications or on separate PCs and servers to meet large systems requirements.
10. The management server and the Bosch Video Recording Manager shall run as services on Windows Server 2008R2, Windows Server 2012 R2 or Windows 7 SP1 (64-bit)and Windows 8.1 (64-bit).
11. The configuration client software shall run as an application on Windows Server 2012 R2. If system contains less than 500 cameras Windows 7 Professional or Ultimate SP1 (64bit) suffices.
12. The operator client software shall run as an application on Windows 7 SP1 or Windows 8.1.
13. The VMS shall support cameras compliant to ONVIF Profile S. It shall be possible to access live streams and to control PTZ functionality.
14. It shall be possible to record Onvif compliant cameras.
15. It shall be possible to use the events provided by an ONVIF camera for the event and alarm handling within the Video Management Software, allowing to configure motion recording amongst others.
16. It shall be possible to view the connection status of Onvif compliant cameras in the Operator Client.
17. It shall be possible to display Onvif compliant cameras in live view on a digital monitor wall connected to a PC or a video decoder.
18. It shall be possible to connect cameras via RTSP stream or MJPEG to the video management system.
19. The VMS shall provide a transcoding service for supporting iPad and iPhone devices as well as html5 based web clients as mobile video clients.
20. The VMS shall provide access to the system by means of Mobile video clients. The Mobile video clients shall consist of an iOS based App and a web-based client. Both Mobile clients shall be able to access live and recording data of all cameras in the video management system. It shall be possible to view up to 4 video streams at once on a web client or iPad and mix live and playback streams. The mobile video clients shall further more support PTZ and provide an option for the user to zoom in as well as to opt between high resolution and smooth motion (higher rate of frames per second). It shall be possible to access the video management system from mobile video clients with the user accounts in the video management system.
21. The web client shall provide means to search for text data in the logbook and access the corresponding video recordings directly from the results.
22. The web client shall provide means to trigger relays configured in the VMS.
23. The web client shall provide means to trigger video export. The export shall be executed on the central management server of the video management system.
24. In addition to live and playback, the iOS Mobile Client shall also provide the security staff with the possibility to use the mobile camera on the iPhone/tablet to record video on their mobile device. They shall be able to select and upload recorded videos from the mobile device to a server with given online connection. Other members of the security staff shall be able to access and watch the uploaded videos on the server using their mobile device.
25. The IOS Mobile Client shall enable security staff to alert and share live video with other security staff members in a very simple manner.
26. The web Client shall provide and indicate, when videos are uploaded from IOS Mobile Clients to the server.

## BOSCH Video Management System

1. The video management system shall be scalable to an Enterprise Management System that allows a user of an operator client to simultaneously access the devices of multiple subsystems. Each subsystems shall contain 1 management server. The Enterprise Management Server shall manage up to 10 subsystems per user group. If each subsystem is restricted to 100 cameras, the number of subsystems may be extended to 30 Subsystems per user group. Access permissions of Enterprise Operator Clients to subsystems and their devices shall be managed within the subsystems by means of a user ID and PW. Enterprise Operator Clients can than only access subsystems, when respective user ID and PW and set correctly in their Enterprise User group. An Enterprise Management Server shall be able to provide 20 Enterprise Management User groups. A change in a subsystem’s configuration shall be automatically reflected for the Enterprise Operator Client. Extensions in the subsystems shall not require any additional licensing within the dedicated Enterprise Management Server.

1. The video management system (VMS) specified shall be a centrally managed, scalable client/server based architecture that allows full virtual matrix switching and control systems.
2. The VMS shall be designed to use a facility’s existing IT infrastructure and require no special cabling.
3. The VMS shall be capable to be deployed in Local Area Networks (LAN) as well as in Wide Area Networks (WAN). For establishing remote connections across WAN, it shall be possible to setup a port mapping table within the configuration manager in order to map the public port to a private IP and port of the devices. The VMS shall provide a RRAS configuration tool to transfer the port mapping table to a RRAS Service.
4. The VMS shall allow a operator client to control and view live and playback streams of cameras allocated to the VRM, VSG and DVRs from a remote site (across WAN). This includes ONVIF cameras connected to the VSG.
5. The VMS shall provide the possibility to the operator to view transcoded video streams (live and playback) in order view high quality images, when the remote operator client accesses the camera via a low bandwidth connection. On selection, there shall be an indication in the image pane of the operator client to indicate, that the stream is being transcoded.

a. Viewing transcoded video streams shall be possible on all clients of the VMS with a minimum of:

i. Microsoft Windows Client

ii. IOs Client for phones and tablets

iii. Web client

b. Transcoding shall be dynamic

* The transcoding feature shall be able to assess the network link quality and speed and provide the most usable image according to the available network link quality.
* The video quality/bandwidth shall be adapter very quickly to link quality changes (for instance 3g/4G, Wifi etc.).
* The transcoding feature shall apply to live and to playback as well.
* There should be an option for the operator of an IOS client to simply & gradually prioritize between motion in the image and image quality.
* When the operator digitally zooms inside a transcoded image, the transcoder should send only the area covered by the zoom, using the whole bandwidth available. This should enable operators with a low bandwidth to view details coming from a high definition or ultra high definition video camera.
* During video replay, when the playback is paused, the transcoder shall send a single, high definition image, to the client, allowing the operator to see all details

1. The VMS shall support Automated Network Replenishment if supported by the devices. The recording is buffered within the memory of the IP camera to cover network outages. The VMS shall receive an event and be able to issue an alarm, when the storage in the camera reaches a critical buffer state as well as when recording is deleted due to the local storage capacity being used up. When an outage is resolved, the camera shall automatically replenish the gaps in the storage. This should be automated and should not require and user input. [CHO : We should also mention that video authentication is retained during this process, when video authentication will be supported at the end of this year]
2. The pre-alarm shall be recorded in the local storage of IP cameras supporting Automatic Network Replenishment and only be transferred to the central storage in the event of an alarm in order to reduce network strain caused by pre-alarms.
3. It shall be possible to configure up to 7 different pre-alarms for each IP camera supporting Automatic Network Replenishment for different events or compound events.
4. It shall be possible to configure the use of Regions of Interest (ROI) in IP cameras supporting it. When an operator uses the region of interest, only the selected area shall be transmitted over the network to reduce network strain.
5. It shall be possible to configure for fixed cameras and PTZ-cameras, that the camera automatically focuses and follows the object which triggers an alarm based on the Intelligent Video Analysis (IVA) techniques of the Bosch IP encoders and IP cameras.
6. The VMS shall provide an easy and comfortable way to the operator to select and connect to a management server from a list of servers during logon. The tool shall provide a search function to quickly find the server by searching for content appearing in the name or description of the servers. This tool to connect to servers shall be capable of listing up to 9.999 servers in its list.
7. The VMS shall automatically detect when management servers are located in different time zones by means of the local time settings in the servers. The operator shall see from the server list in device tree, which management servers’ time zone is currently displayed in the operator’s User Interface. The operator shall be given the possibility to set his own operation time to a dedicated time zone of one of the management servers. Selected time zone shall be applied to live view, playback, the alarm list and the logbook. Operator shall also be able to select UTC time.
8. The VMS shall provide a built-in command script editor that allows customized command scripts to be written to control virtually all the system functions. Command scripts may be activated by system operators or automatically in response to alarms or system events. The built-in command script editor shall support C# and VB.NET.
9. The VMS shall support all Bosch Security Systems MPEG-4 and H.264 encoders, decoders, IP cameras, IP AutoDomes, Bosch Recording Station NVRs, Allegiant matrix switches, Bosch Recording Stations/DiBos, Bosch POS/ATM bridge.
10. The VMS shall have one operator client that can playback VRM recordings, Bosch Recording Station/DiBos recordings, and Bosch Recording Station NVR recordings simultaneously.
11. The VMS shall have one operator client that can export all recording listed in (E) to one single archive
12. The VMS specified shall support the following languages:  
    English, German, Dutch, Italian, Portuguese, French, Spanish, Simplified Chinese, Traditional Chinese, Russian, Hungarian, Czech, Danish, Finnish, Greek, Norwegian, Polish, Swedish, Thai, Turkish, Japanese, Korean and Arabic.  
    The VMS shall allow specifying the language per user group in order to enable multiple languages for different operators in one system. The VMS shall allow specifying the language for configuration client. If “Default System language” is specified, the system shall use the same language as the Operating System language.
13. The VMS shall provide up to 10 different and independent programmable recording schedules. The schedules may be programmed to provide different record frames rates for day, night, and weekend periods as well as special days. Advanced task schedules may also be programmed that could specify allowed logon times for user groups, when events may trigger alarms, and when data backups should occur.
14. The VMS shall allow the establishment of user groups and Enterprise user groups that have access rights to specific cameras, priority for pan/tilt/zoom control, rights for exporting video, and access rights to system event log files. Access to live, playback, audio, PTZ control, preset control, and auxiliary commands shall be programmable on an individual camera basis.
15. The VMS shall support Dual Authorization logon. It shall function as follows:
16. Dual Authorization user groups may be created.
17. Logon pairs, consisting of any two normal user groups, may be assigned to each Dual Authorization user group.
18. A separate set of privileges and priorities can be assigned for each Dual Authorization user group.
19. For each user group assigned as part of a logon pair, it shall be configurable whether the group can  
    - Log on either individually or as part of the logon pair  
    - Or log on only as part of the logon pair.
20. If a user that is part of logon pair logs on individually, then he shall receive the privileges and priorities of his assigned user group. If the same user logs in as part of a logon pair, i.e. being authorized by the second user, then the user shall receive the privileges and priorities assigned to the Dual Authorization group to which the pair is assigned.
21. The logbook shall log the log on procedure to identify a single user or a dual authorization log on. Subsequent user actions shall be logged as the actions of the first user.
22. Dual authorization shall also be available for an Enterprise Management System.
23. The VMS shall interface with the Intelligent Video Analysis (IVA) techniques of the Bosch IP encoders and IP cameras to provide advanced motion detection that analyzes object size, direction, and speed as well as detecting objects entering or leaving designated areas. The VMS shall also support the detection of fire supported in the Intelligent Video Analysis in the near futre.
24. The VMS shall support configuring the IVA parameters from the configuration client.
25. The VMS shall react to events triggered by the IVA of the encoders or IP cameras.
26. The VMS workstations may be connected to up to 4 monitors where each monitor may be configured to display live streaming video, playback video, site maps, or alarms.
27. The VMS shall support Lightweight Directory Access Protocol (LDAP) that allows integration with enterprise user management systems such as Microsoft Active Directory.
28. LDAP shall also be available for an Enterprise Management System. LDAP shall be configurable in an Enterprise user group.
29. The VMS shall export video and audio data optionally in ASF format to a CD/DVD drive, a network drive, or a USB drive. The exported data in ASF format may be played back using standard software such as Windows Media Player.
30. The VMS shall export video and audio data optionally in its native recording format to a CD/DVD drive, a network drive, or a direct attached drive. The exported data in native recording format shall include all associated metadata. Viewer software shall be included with the export. Once installed, the viewer software allows playback of the streams on any compatible Windows PC.
31. The VMS shall auto-discover encoder, decoder, VRM devices and DVRs. Device detection shall support devices in different subnets.
32. The VMS shall auto-discover Bosch IP devices with their default IP addresses, and allow auto-assignment of unique IP addresses.
33. The VMS shall be able to simultaneously configure multiple Bosch encoders or decoders, even of different types. When devices of different types are being configured, only the parameters available in all devices are available for configuration.
34. The VMS shall ensure, that Recording is not affected in any way by server downtimes.
35. The VMS shall ensure continues operation during management server down-times as live viewing, playback of recording and export of video data.
36. The operator client shall indicate its connection status to the management server.
37. An Enterprise Operator Client shall be capable of working offline. The status of each connection to a subsystem’s management server shall be indicated. The client should be able to operate offline for as long as necessary. There should not be any time limit.
38. The VMS shall be designed in such a way that configuration changes to any part of the system shall not interrupt operational tasks, until the operator decides to update re-fresh the workstation configuration.
39. The VMS shall be highly resilient to failure. Even in a concurrent failure of all Management server(s), VRM(s) and iSCSI storage, the operators shall still be able to view & control cameras as well as playing back the video from cameras with a memory card.
40. When the failed system components are back online, no special user or administrator action shall be required for the system to be back to a nominal working mode.

## Video Management System Components

1. The management server software shall provide management, monitoring, and control of the entire system. The management server software should typically be installed on a server-class computer, but may be installed, with all the other video management software modules on one workstation. The management server shall also maintain data stream management, alarm management, priority management, central logbook, central configuration and user management.
2. Software updates to the operator client and configuration client shall be automatically deployed from the management server.
3. The VMS shall be designed in such a way the management server downtimes do not affect the functionality of the recording services (Bosch Video Recording Manager, Bosch Recording Station NVRs, Local Storage, Direct-to-iSCSI-Recording), DVRs. Normal recording and Motion recording shall continue during the management server downtimes, only Alarm Recording cannot be activated as the management server is responsible for evaluating the alarm conditions. During management server downtime the recording services shall still be able to change the recording parameters schedule dependent.
4. Configuration client software shall provide the user interface for system configuration and management.
5. Operator client software shall provide the user interface for system monitoring and operation. The operator client maintains live monitoring, storage retrieval, and alarm handling.
6. Operators should still be able to login in the operator client software even if the management server is down or not available.
7. The management server should be compatible with 3rd party high availability solutions (VM-Ware; Microsoft Hyper V) in High Availability –mode. The downtime during unplanned failover should be max 300 seconds. Planned Failover should not cause any downtime.

## Video Recording Manager (VRM)

1. The VMR shall be an optional package of the installation program of the VMS.
2. The video management system shall be capable of managing multiple VRMs.
3. The VRM shall be configured from the VMS configuration client. It shall be possible to assign encoders and IP cameras to it.
4. The recording parameters shall be configured in the recording tables of the VMS configuration program. These settings will be replicated into the devices from the management server.
5. The VRM shall manage exclusively the Bosch encoders, Bosch IP-Cameras, Bosch Streaming Gateways, and the Bosch supported iSCSI storage systems. It shall offer system wide recording monitoring and management of iSCSI storage, video servers and cameras.
6. The VRM shall support the encoders and cameras to directly stream the data to the iSCSI storage. The VRM shall not be involved in the processing of the data.
7. The VRM shall manage all disk arrays in the system as a single virtual common pool of storage. It shall dynamically assign portions of that pool to the encoders and IP-Cameras.
8. The transfer rate of the data from the encoder or IP-Camera is limited by network speed and the iSCSI data throughput rate.
9. The VRM shall provide redundancy for storage provisioning and failover design for central recording management service.
10. It shall be possible to configure a secondary VRM recording for a selection of camera. Cameras thus record on a different recording target (dual recording). It shall be possible to configure different quality settings for the secondary VRM.
11. It shall be possible to configure a mirrored recording mode where the secondary VRM automatically contains the same devices and quality settings as the primary VRM. Hence, when cameras are added to the primary VRM, they are automatically recorded on the secondary VRM as well. Retention time of the primary and secondary VRM may differ though.
12. It shall be possible to configure failover VRMs for primary and secondary VRMs. In the event of a master VMR failing, the secondary VRM takes over the tasks of VRM that failed.
13. The VRM shall be able to restore a lost recording database from data on the iSCSI storages.
14. The VRM shall provide flexible retrieval of recordings. It shall be able to determine on which iSCSI disk array data from each camera or encoder has been stored.
15. It shall be possible to secure the access to the VRM software with a password. This shall be done in the configuration client.
16. The VRM software shall provide status monitoring information as a web interface. The following information shall be provided:
    1. Uptime of the VRM software
    2. Bit rate information for the recorded data
    3. Retention times per camera
    4. Status on recording and storage
17. The video management system shall allow configuring if playback of recordings is streamed through the VRM or is streamed directly from the iSCSI storage.
18. The video management system shall support to retrieve the playback information, i.e. from which iSCSI storages to retrieve the video, audio and meta-data, either from the Video Recording Manager or directly from the IP encoder or camera. Playback information directly from the IP encoder or camera is limited in time and should be used while the VRM is not available to increase the reliability of the video management system.

## Bosch Recording Station NVR support

1. The VMS shall be able to integrate Bosch Recording Station NVRs. It shall be possible to playback data recorded by Bosch Recording Station NVRs. This shall include MPEG-4, H.264, and JPEG data.
2. The video management system shall be capable of managing multiple Bosch Recording Station NVRs.
3. The cameras connected via Bosch Recording Station shall behave the same as VRM managed IP cameras in the video management system operator client, with the following exceptions:
4. The Bosch Recording Station camera icons shall include a graphical indication that the cameras are from Bosch Recording Stations.
5. Bosch Recording Station cameras are not displayable on decoder outputs.
6. The operator client shall display live and recorded data from cameras assigned to Bosch Recording Station NVRs. In playback mode the Bosch Recording Station NVR cameras shall appear in the graphical timeline.
7. Changing the configuration of a Bosch Recording Station NVR shall require the Bosch Recording Station NVR configuration software which is not integrated into the VMS.

## Support of Monitor Walls

1. The VMS shall support analog monitors connected to IP decoders as well as monitor walls.
2. It shall be possible to configure analog monitors in full screen mode or quad mode. When in quad mode, the VMS shall be able to select video and control cameras in any quadrant.
3. It shall be possible to group analog monitors into Analog Monitor Groups (AMGs). An AMG shall specify a monitor arrangement of rows and columns.
4. It shall be possible to restrict access to AMGs to specified operator client workstations.
5. The VMS shall support a monitor wall for an Enterprise System, i.e. an Enterprise Operator Client shall be able to see the cameras of the various subsystems on a monitor wall.
6. The VMS shall support a monitor wall supporting connection of up to two HD monitors via HDMI to display asymmetrical layouts. It shall also support H264 and HD.
7. The VMS shall support the display of IP cameras on the Barco Transform N series with up to 64 cameras and asymmetrical layouts. It shall be possible to select cameras in a special control within the operator client to show them on the Barco Monitor Wall.

## Alarm Management Capability

1. The video management system shall provide the capability to allow alarms to be schedule-dependent.
2. The video management system shall allow alarms to be individually allocated to specific user groups for processing.
3. The video management system shall support replication of events such that a single physical event causes multiple system events. These multiple events shall be independently configurable to allow independent handling of the alarms by multiple operator groups, or to be handled differently according to different schedules.
4. The video management system shall be programmable to selectively, per alarm and per user group, automatically pop-up the alarm video.
5. The video management system shall support display of alarm video in a special Alarm Image Window so users do not have to search their display screens to find the alarm images.
6. The video management system shall display alarm video in rows of Alarm Image Panes, with one row per alarm, and with up to 5 Image Panes per row.
7. The video management system's Alarm Image Panes shall be configurable to display live video, playback video, text documents, site maps, HTML files, or web sites (URLs). Per alarm one playback video and one site map can be configured.
8. The video management system's Alarm Image Pane rows shall be displayed in order of their priority, with rows for higher priority alarms always displayed above lower priority alarm rows. The display order for equal priority alarms shall be selectable between new alarms displayed above existing alarms, or new alarms displayed below existing alarms.
9. The video management system shall provide an alarm reaction time of maximum 2 seconds when sufficient network bandwidth is available.
10. The video management system shall distribute alarm notifications, via entries in the alarm list of the operator user interface, to all members of the user groups to which the alarm is assigned. The alarms shall appear in all said users' alarm lists.
11. The video management system shall operate as follows: when an alarm is accepted by a user, it shall be removed from the other users' alarm lists.
12. The video management system shall allow a user to un-accept an alarm he has previously accepted. In this case, the alarm shall re-appear in the alarm lists of all members of the user groups assigned to this alarm.
13. The video management system shall support the association of workflows with alarms. Workflows shall consist of action plans and comment boxes. An action plan shall display a text document, HTML page, or web site that typically contains instructions for handling the alarm. Comments entered in the comment boxes shall be logged in the system logbook.
14. The video management system shall be configurable to force an alarm workflow. In this case, the alarm cannot be cleared until the workflow is processed.
15. The video management system shall offer the possibility to automatically clear alarms when the originating event condition is no longer true.
16. The video management system shall allow alarms to be configured to send PTZ cameras to prepositions or to execute camera Aux commands on occurrence.
17. The video management system shall be configurable to put any IP-connected camera into alarm recording mode on alarm occurrence.
18. The video management system shall be configurable to send an e-mail or SMS message in response to an alarm.
19. The VMS shall be capable of displaying video on analog monitors connected to video decoders in response to alarms.
20. The VMS alarm response shall take advantage of the row and column arrangement of analog monitor groups by associating a row of analog monitors with each active alarm. Each alarm may display video on multiple monitors, limited by the number of columns in the analog monitor group.
21. As new alarms are received, alarm rows shall stack in priority order on the analog monitors.
22. The VMS shall support for alarms to display video on multiple analog monitor groups, with configurable assignment of individual assignment of alarms to monitor groups.
23. In an Enterprise System, for each alarm shall be indicated which subsystem’s management server triggered the alarm.

## Matrix Switch Connection

1. The video management system shall interface with the Bosch Allegiant family of video matrix switches. Video Encoders shall be connected to one or more monitor outputs of the matrix switcher to provide the video interface.
2. The video management system shall automatically import the camera names from the matrix switch.
3. Matrix switch cameras shall behave the same as IP cameras in the video management system operator client, with the following exceptions:
4. The matrix switch camera icons shall include a graphical indication that the cameras are from a matrix switch.
5. Cameras from the matrix switch are not recorded and are therefore not available in playback mode.
6. The number of cameras from a matrix switch that are simultaneously displayed on client workstations is limited to the number of encoders connected to monitor outputs. If a user tries to exceed this limit, the video management system shall assign the available outputs based on user priority.
7. The video management system shall receive and process events from the matrix switch, including alarm events and video loss events.
8. The video management system shall support switching of cameras on the matrix switch monitors via context menus on the Allegiant cameras in the video management system logical tree.
9. It shall be possible to configure the system to use the Matrix Switch PTZ connections to control PTZ cameras when the video is looped from the Matrix Switch inputs to video encoders. The configuration interface shall allow specification of the logical camera numbers in the Matrix Switch, then the video management system shall route PTZ commands for corresponding cameras to the Matrix Switch.

## Connection to the Bosch Recording Stations (BRS)/DiBos and Digital Video Recorder (DVR) Connection

### Connection to Bosch Recording Stations (BRS)/DiBos

1. The video management system shall interface with the Bosch Recording Station (BRS)/DiBos v8 family
2. The video management system shall be capable of managing up to 100 BRS per Management Server and 500 in an Enterprise Management System.
3. The video management system's BRS-connected cameras shall behave the same as IP cameras in the video management system operator client, with the following exceptions:
4. The BVR camera icons shall include a graphical indication that the cameras are from BVRs.
5. BVR cameras are not displayable on decoder outputs.
6. In the playback mode of the VMS operator client, BVR-connected cameras shall appear in the graphical timeline, and can be operated identically to IP cameras.
7. Changing the configuration of a BRS/DiBos shall require the BRS/DiBos configuration software which is not integrated into the VMS.

### Connection to DVR 400, 600 and 700

1. The video management system shall interface with the Bosch DVR 400, 600 and 700 series.
2. The video management system shall be capable of managing up to 15 DVRs per Management Server

1. The video management shall support live view, playback and PTZ of the cameras connected to the DVRs.

It shall be possible to switch controllable relays of the DVRs in the device tree of the Operator Client.

1. The video management software shall support the following special DVR events of DVR 400 and 600: Disk failure, Disk full, Fan failure, Temperature above limit, System alarm state, Software incompatibility.

## Relays and Digital Inputs

1. The open/close states of inputs and relays from devices connected to the system, including IP cameras and PTZ cameras, video encoders and decoders, matrix switchers, and DVRs shall be indicated on the VMS operator client user interface and can be queried via the VMS SDK.
2. Relays from devices connected to the system shall be controllable from command scripts, the VMS SDK, and icons on the operator client user interface.
3. Input and relay state changes from devices connected to the system shall be recognizable as events in the VMS.
4. It shall be possible to configure one malfunction relay used to indicate an occurrence with special severity. It shall be possible to configure compound events to trigger the malfunction relay.

## Logbook

1. The system shall protocol every event and alarm in an SQL database. The alarm entry shall contain the camera titles that have been recorded due to this alarm.
2. The logbook shall be able to store at least 500,000 entries per hour. If the capacity of the logbook is filled up the oldest entries will be deleted to create space.

1. The user shall be able to search the logbook for events and alarms. The user shall be able to export the search results into a comma separated value list (CSV).
2. The system shall included and install a ready-to-use SQL database. The system shall optionally allow the usage of a separately installed SQL database.

## Digital I/O Interface Connection

1. The VMS shall interface to the Advantech ADAM 6000 family of digital I/O devices.
2. The digital inputs and relay outputs from the ADAM devices shall provide all of the features and functionality described in the Relays and Digital Inputs section of this document.
3. ADAM 6000 family of devices attached to the network shall be automatically discoverable via a network scan.

## SNMP

1. The video management system shall be capable of monitoring third-party equipment SNMP protocol.
2. The video management system shall provide a Management Information Base (MIB) to enable other Physical Security Information Management Systems (PSIM) to monitor the video management system by means of SNMP traps.

## Pre-Programmed Camera sequences

1. The video management system shall support pre-programmed camera sequences. These sequences will allow cameras to be automatically displayed on the computer image panes and/or analog monitors connected to decoders. The sequences shall support simultaneous display on multiple image panes or monitors. The sequences shall also support camera prepositions for each PTZ camera on each sequence step. The system shall be configurable such that operators can select these sequences from the logical tree or a site map.
2. Pre-programmed camera sequences can be displayed in operator client and on Analog Monitor Groups.

## Command Scripts

1. The video management system shall provide a command script interface that allows system operations to be programmatically controlled.
2. The system shall provide a built-in editor for the creation of the command scripts.
3. The system shall be configurable such that operators can execute the created scripts by double-clicking on representative icons in a logical tree or site map.
4. The system shall be configurable such that the created scripts can be executed automatically in response to a system event. The automatic event-driven execution shall optionally be schedule-dependent.
5. The system shall be configurable to execute a user-group dependent command script on user logon.
6. The system shall be configurable to execute an alarm-dependent command script on user acceptance of the alarm.

## Virtual Inputs

1. The video management system shall provide a software interface that allows third-party software to generate events in the video management system. The software shall support any COM programming languages (e.g. Visual Basic and C++), any .Net programming language (e.g. C#) or JavaScript.
2. The VMS shall allow third-party software to include up to 10 data fields and an Alarm ID along with the virtual input event.
3. These fields shall be searchable in the system logbook.
4. The virtual input data shall be optionally displayed in the operator client playback mode synchronously with the associated video.

## SDK

1. The video management system shall provide a documented Software Development Kit (SDK) to allow integration to and integration from third-party software.
2. The SDK shall expose all functionality of the command scripts, including, but not limited to:

* Control of operator workstation image window layout
* Assignment of cameras, documents, URLs, and maps to operator client workstation image panes
* Assignment of cameras to analog monitors connected to encoders.
* Dome control
* Alarm generation
* Recording mode control
* Exporting recorded data
* Relay control

1. SDK functionality shall require authentication to the system.
2. The SDK shall be accessible from all .Net programming languages.
3. A CameoSDK shall be available which allows for programming 3rd party operator clients.
4. A Remote Client SDK shall be available which allows for programming an interface between a running VMS operator client and a 3rd party management system.

## OPC Interface

1. The VMS shall provide an OPC Server for integration into third-party software systems, such as building-management systems.
2. The OPC interface shall follow the OPC Alarms and Events standard.

## CCL Interface

1. The VMS shall emulate the Allegiant Command Console Language (CCL). It shall be possible to select the Allegiant model that shall be emulated.
2. CCL commands shall control:
   1. Camera to decoder connections
   2. Sequences on decoders
   3. Virtual Inputs
   4. PTZ commands
3. The video management system shall receive the CCL commands on a freely definable serial port on the management server.

## Configuration Changes

1. Configuration changes made in the VMS configuration client shall modify a working copy of the configuration, and shall not affect the active operating configuration.
2. It shall be possible to activate the working copy through a user action in the configuration client, at which point the working becomes the new active operating configuration.
3. It shall be possible to set a date and time in the future at which the working copy becomes active.
4. It shall be possible to view a list of all configuration activations that have been applied to the system. It shall be possible to select any of the activated configurations, and have the system "roll back" to an earlier configuration.
5. It shall be possible to activate a configuration and leave it to the operator to refresh the configuration locally instantly or at a later point in time. It shall be possible to enforce a configuration activation for every operator client connected to the management server.

## Operator Client

* + 1. An operator client user logging on to an Enterprise Management Server shall be able to simultaneously access the devices of up to 10 subsystems and a total number of 10000 encoders/cameras. If each subsystem contains less than 100 cameras, the video management system shall support up to 30 subsystems for simultaneous access to the devices.
    2. If an operator client loses its connection to the management server, the user shall nevertheless be able to continue working with the connected devices.
    3. The video management system shall provide an administrator-configured Logical Tree. The logical tree shall be freely configurable with any tree structure, with nodes consisting of folders or maps, and leaves consisting of devices (cameras, inputs, and relays), sequences, documents, URLs, or command scripts. Each user group shall only see items in the logical tree for which the administrator has granted access.
    4. The logical tree of an Enterprise operator client displays the available device for each configured management server of a subsystem and their connection status.
    5. The user shall be able to search the logical tree for item names.
    6. The VMS shall provide a user-dependent bookmark Tree. The bookmark tree shall allow saving a time period or a single point in time for later investigation and export. Bookmarks shall be available both for live mode and for playback mode.
    7. The VMS shall provide a user-dependent Favorites Tree. The favorites tree shall allow maps, folders, and devices and complete views (image pane patterns with camera assignments) to be configured by each user in a user-defined structure. The user's favorites tree shall be available irrespective of the computer with which he logs on to the system.
    8. The video management system shall provide an Image Window that displays a collection of Image Panes. The layout shall be optimized for standard and widescreen monitors. With standard monitors the number of image panes per image window shall be variable between 1 (a single full-window video) and 25, arranged in a 5x5 grid. A slider shall be available allowing the grid size to be changed from 1x1, 2x2, 3x3, 4x4, and 5x5. With widescreen monitors the number of image panes per image windows shall be variable between 1 and 30, arranged in grids of 1x1, 3x2, 4x3, 5x4, and 6x5. The VMS shall allow image panes to be enlarged or decreased in size within the grid. E.g., in a 5x5 grid, a single image pane can be enlarged to use 4 of the grid elements, creating a larger image within the grid. Any pattern can be created within the grid structure. An image pane can be resized by clicking and dragging on any corner, dragging the corner to the desired size.
    9. The video management shall implement the concept of a selected image pane. The selected image pane shall be highlighted. There shall always be a selected image pane in the operator client application. The selected image pane is always used for control commands, e.g. PTZ control, instant playback control, and audio replay.
    10. The video management system shall support the audio channels of the Bosch encoders and IP cameras. It shall be possible to assign audio sources to cameras. In the operator client it shall be possible to turn on/off the replay of the audio per camera.
    11. The video management system shall support two different audio modes, single source audio and multi source audio.  
        In single source audio mode only the audio source assigned to the camera in the selected image pane is replayed.  
        In multi source audio mode all audio sources of the cameras displayed in the client application are replayed.
    12. The video management system shall support site maps with hot-spot icons for devices (cameras, relays, and inputs), command script initiation, camera sequence initiation, and links to other site maps. The site maps shall be capable of being zoomed. The hot-spot icons shall be configurable to optionally display the device name or link title.
    13. The operator client shall display live streams from encoders. For Bosch IP-cameras and encoders it shall be possible to configure per workstation and individually per camera which encoding stream (Stream 1 or Stream 2) of these devices shall be displayed.
    14. The operator client shall support the display of the live stream of an ultra HD camera in multiple image panes without the impact on the CPU-load of the operator client. It shall be possible to adapt the different views per image pane using E-PTZ and to save the multi-view as a favorite. When selecting the favorite, the customized live view including the ultra HD views of the same camera are called up on screen. The
    15. Operator Client shall support dewarped panoramic views for displaying 360° cameras. When operator is using E-PTZ in the image pane, an overlay shall indicate his position for better orientation.
    16. The Operator Client shall provide dewarped playback for video recorded with a 360° lens.
    17. It shall be possible for the operator to pick an object in a live stream and select, that the camera focuses and follows that particular object automatically.
    18. The video management system shall support automatic sequencing. It shall be possible for users to multiple-select cameras (control-click or shift click), and drag the multiple-selection to an image pane or a graphic representing an analog monitor connected to a decoder. All of the cameras in the selection shall then sequence in the image pane or monitor at a user-selectable rate. It shall also be possible to drag a folder to an image pane or analog monitor. In this case, all of the cameras contained within the folder shall sequence.
    19. The video management system shall support PTZ control with a dedicated graphical joystick control, supporting Pan, Tilt, Zoom, Iris, Focus and Aux Command operations. It shall also support PTZ control via clicking the mouse in the image panes. For PTZ cameras, the cursor shall change to indicate the Pan/Tilt direction when hovering over the corresponding image pane. The Pan/Tilt speed shall increase as the cursor moves farther from the center of the image pane. An area in the center of the image pane shall be used for zoom-in/zoom-out control. Once zoom is initiated, the zoom speed shall increase as the cursor is moved farther from the center of the image pane.
    20. The video management system shall support digital zoom of any image pane. A dedicated graphical control shall be provided in the user interface for this purpose. In addition, the mouse wheel shall control digital zoom when the mouse cursor is hovering over a selected image pane.
    21. The video management system shall provide an Instant Playback function that displays recorded images on one or multiple image panes. Recorded images from a single camera may also be played back on multiple panes. Instant playback supports pause, play forward, play reverse, single step forward, single step reverse, fast-forward, and fast-reverse.
    22. The video management system shall support a timeline that provides a graphical overview of video stored on the disk. The timeline shall display a timescale that can be adjusted from at least 15-minutes per division to 1 month per division. For each camera displayed in playback mode, the timeline shall provide a line that depicts the video storage for that camera. The line shall be color-coded to show if video is recorded for the displayed time period, and if so, if it is normal recording, motion recording, or alarm recording. The line shall be cross-hatched if the video is protected from deletion. The line shall also indicate if associated audio is recorded during the displayed time period.  
        For VRM and Local Storage recordings color coding is limited to protection and audio indication.
    23. The video management system shall support simultaneous time-synchronous playback. Playback shall support single-step forward and backwards; play normal speed forward and backwards; play high-speed forward and backwards; and play slow-speed forward and backwards.
    24. The video management system shall support search of recorded video for motion in user-specified areas of a camera image. This cell based post-recording motion search will work for cameras recorded by Bosch Recording Station NVRs and Bosch DiBos DVRs.
    25. The video management system shall support search of recorded video with at least the following criteria: object size, object color, direction, and speed as well as detecting objects entering or leaving designated areas. This Intelligent Video Analysis (IVA) based post-recording search will work for cameras recorded by VRM and Local Storage.
    26. The video management system shall optionally display the information of the video analytics such as cells with detected motion, object masks, and trajectories in live and playback.
    27. The video management system shall support searching based on any combination of time/date-rage, event type(s), alarm priority, alarm state, and device(s). It shall be possible to save and recall search parameters.
    28. The video management system shall support search for text data retrieved from ATMs, point of sales, barcode readers or other applications. The search shall be performed in the logbook using a wildcard search. The search results shall appear in a list and selection of a result shall directly call up the exact video images recorded with the text data.
    29. The text data shall be displayed in the image pane of the corresponding camera in live and playback. It shall thus be possible to simultaneously display text data of multiple cameras. The operator shall furthermore be able to choose whether the text data is displayed on the right side or below the image pane.
    30. The video management system shall graphically display device states on its icons in the logical tree structure and on sitemaps. For cameras, the states shown shall include: loss of the analog video signal, network connection loss, video recording, video signal too noisy, video signal too bright, video signal too dark, video de-adjusted, and video includes associated audio. For relays and contact inputs, the open or close state shall be indicated.
    31. The video management system shall support switching of cameras to analog monitors connected to decoders. The cameras shall be selectable via drag and drop from the logical tree or from the sitemaps.
    32. The video management system shall support an indication for the operator client regarding the connection state to the management server. This shall include connected, disconnected, and configuration out-of-sync between management server and operator client.
    33. The operator client shall support a configurable inactivity logoff for security reasons. The operator client will logoff automatically when no activity is detected from the operator in a configured period of time.
    34. The video management system shall support a centrally stored user profile to store settings individual for each operator. These settings shall include but are not limited to sequence dwell times, instant playback replay time and image pane ratio settings (16:9 or 4:3) individually per monitor. These settings shall be available independently of the physical workstation to the operator.

## Audio Intercom Functionality

1. The video management system shall support bidirectional audio intercom functionality. Audio intercom streams audio data from an operator client Workstation to the audio output of the Bosch encoders.
2. The audio intercom function shall be activated by a button in the operator client Workstation. When the button is pressed the operator shall be able to speak into a microphone on the client computer. The audio shall be transmitted to the audio source which is assigned to the currently selected camera.

## CCTV Keyboard Control

1. The system shall allow system control via the Bosch IntuiKey family of keyboards, including the KBD-DIGITAL and KBD-UNIVERSAL
2. The Bosch IntuiKey keyboards shall support an Enterprise System, i.e. with a keyboard connected to an Enterprise operator client the desired subsystem’s management server shall be selectable.
3. Keyboard connections shall be possible to both Bosch VIP-XD Decoders and to operator client Workstations.
4. When CCTV Keyboards are connected to VIP-XD decoders, it shall be possible to control the analog monitor groups in the system via the CCTV keyboard.
5. When CCTV Keyboards are connected to VIP-XD decoders, it shall be possible to control PTZ operation of the selected camera using the keyboard joystick.
6. When CCTV Keyboards are connected to VIP-XD decoders, it shall be possible to control set and call-up PTZ prepositions of the selected camera using the keyboard.
7. When CCTV Keyboards are connected to VIP-XD decoders, it shall be possible to execute PTZ and AutoDome Aux commands on the selected camera using the keyboard.
8. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to control the current Image Pane selection using the keyboard joystick.
9. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to control the analog monitor groups in the system or control any Image Pane on the connected operator client Workstation, using the CCTV keyboard.
10. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to control PTZ operation of the selected cameras using the keyboard joystick.
11. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to control set and call-up PTZ prepositions of the selected camera using the keyboard.
12. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to execute PTZ and AutoDome Aux commands of the selected camera using the keyboard.
13. When CCTV Keyboards are connected to operator client Workstations, it shall be possible to control playback of video, including both Instant Playback and Playback-mode synchronous playback, using the CCTV keyboard.
14. When CCTV Keyboards are connected to operator client Workstations, playback control should include jog-shuttle emulation using the Keyboard Joystick.
15. When in Jog-shuttle emulation mode:
    1. Rotating the Keyboard joystick will control forward and reverse playback, with playback speed proportional to the amount of joystick rotation.
    2. Moving the joystick up shall set the video into slow forward playback mode. Additional upward movements shall incrementally increase forward playback speed
    3. Moving the joystick down shall set the video into slow backward playback mode. Additional downward movements shall incrementally increase backward playback speed.
    4. Moving the joystick right shall set the video into pause mode. Additional rightward movements shall step the video one frame forward.
    5. Moving the joystick left shall set the video into pause mode. Additional leftward movements shall step the video one frame backward.

## Integration with Intrusion panel

1. The video management system shall be able to connect to Bosch UL-approved intrusion panels and browse the areas and devices configured in the panel in the Configuration Client.
2. The video management system shall be able to connect to 20 intrusion panels.
3. The video management system shall be able to map the events of the intrusion panel to events in the video management system in order to use these events in the event and alarm engine of the video management system.
4. The video management system shall provide separate user permissions to arm, force arm and disarm intrusion panels.
5. The video management system shall be able to use the events of the intrusion panel to create compound events to trigger actions.
6. The Operator Client shall provide the possibility to arm, force arm and disarm areas via context menu.
7. The Operator Client shall indicate the connection and authentication state of the intrusion panels by means of icons.
8. The Operator Client shall indicate the state of the areas (armed, disarmed, unknown) by means of icons.
9. The Operator Client shall indicate the state of the areas (armed, disarmed, unknown) by means of icons.
10. The Operator Client shall indicate the state of the areas by symbols placed on the map.

The product specified shall be the Bosch Video Management System manufactured by Bosch Sicherheitssysteme GmbH.

Bosch VMS 05/Feb/2015 Specifications subject to change without notice