

# **A&E Specification**

## **Enterprise Class Video Management Software**

### **Physical Security Information Management (PSIM)**

The A&E Specification for Enterprise-Class VMS & PSIM (Video Management System & Physical Security Information Management) is a comprehensive guide for architects and engineers designing video surveillance systems. It outlines the requirements, capabilities, and standards associated with enterprise-grade VMS & PSIM.

Enterprise-class VMS (Video Management Software) goes beyond basic functionalities, catering to large-scale deployments with multiple locations and complex security needs. Scalability, reliability, security, flexibility, interoperability, and usability are crucial factors considered in the specification.

PSIM (Physical Security Information Management) is a software solution that integrates and manages data and events from various security systems, such as video surveillance, access control, fire alarms, intrusion detection sensors & to an extent of supporting BMS datapoints. The PSIM provides a centralized platform that allows security personnel to monitor, analyze, and respond to security incidents in real-time.

Some key features of PSIM software include advanced analytics, situation management, integration with third-party systems, reporting, and visualization tools. PSIM makes it easier for security personnel to take informed decisions in real-time by providing them with real-time situational awareness and an accurate view of the entire security infrastructure.

The VMS & PSIM should efficiently handle numerous cameras and manage video streams across distributed networks. It should provide high availability and robust security measures to protect sensitive video data. Interoperability with third-party systems and seamless integration with existing infrastructure are key requirements.

The specification should address flexibility, scalability, and support for diverse camera types and brands. User-friendly interfaces simplify configuration, video playback, and system administration tasks. A well-designed VMS / PSIM enhances security, improves operational efficiency, and helps organizations achieve their strategic objectives.

In conclusion, the A&E specification for enterprise-class video management software provides architects and engineers with a comprehensive framework for designing and specifying sophisticated video surveillance solutions. By considering factors such as scalability, reliability, security, flexibility, interoperability, and usability, organizations can ensure the successful implementation of a robust VMS/PSIM that meets their specific requirements. With the right VMS/PSIM in place, businesses can effectively leverage video data to enhance security, streamline operations, and achieve their strategic objectives.

# Architectural & Engineering Specification

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## Enterprise Class VMS Software by WatchNET

NetFLOW Professional is best-in-class, new-generation Video Management Software that is based on open standards to offer a truly open platform. NetFLOW Professional's reliability, performance, and convenience are unmatched on the market. Experience unprecedented flexibility and freedom of configuration: unlimited number of video servers, video cameras, workstations and mobile client devices, and more than 9900 IP devices are all supported. Thanks to the program's application programming interface (API), NetFLOW Professional allows easily integrating third-party hardware to extend your video system's functionality yet further. The advanced ergonomic interface makes all functions intuitively easy to use and find. A transparent customer-oriented pricing policy means that you can take advantage of the program's full functionality, no matter the size of your system.

### NETFLOW PROFESSIONAL HIGHLIGHTS:

- Unlimited number of cameras, servers and remote clients
- Support for more than 9900 IP devices
- AI Powered Analytics
- Offline Analytics
- Moment Quest
- Interactive 3D Map
- Green Stream
- Metadata from IP Devices
- NetFLOW Retail Pack
- Mobile Clients

### AI Powered Analytics

NetFLOW Professional video management software incorporates a powerful system for analysis of video images. It includes the following video detection tools:

- a. Motion detection – captures any movement in the scene;
- b. Detection for loss of video quality – is triggered when the image quality deteriorates due to blurring or soiling or blinding of the lens. or darkening of the image, etc.;
- c. Image Noise Detection – similar to Quality Loss detection;
- d. Abandoned objects detection – is triggered when some object – a briefcase, box, bag, etc. appears in the scene and remains motionless for some time;
- e. Detection of crossing a line in a given direction – is triggered when a moving object crosses the virtual line in the user-specified direction;
- f. Loitering detection – is triggered when an object remains in a user-specified area for some time;
- g. Zone Entry Detection – is triggered when any object appears within a user-specified area;
- h. Zone Exit Detection – is triggered when the object leaves the user-specified area or when the object located in the area disappears from the camera FoV;
- i. Water level detection – determines and displays the water level.

### Neural Counter Analytics:

- a. Neural tracker – detects the position of required objects using a neural network;
- b. neural counter – counts the number of objects in a given zone using a neural network;
- c. smoke detection – is triggered when the smoke appears in the camera FoV;
- d. fire detection – is triggered when the fire appears in the camera FoV;
- e. equipment detection tool (PPE) – is triggered when a person wearing no personal protective

- equipment appears in the frame;
- f. Person-based privacy masking – hides the specified body parts in the video image, and does not trigger the alarms.
  - g. pose detection:
    - a. Recumbent person detection – is triggered when a person laying down is detected in the camera FoV;
    - b. Sitting person detection – is triggered when a person sitting down is detected in the camera FoV;
    - c. Hands up detection – is triggered when a person raising their one or two arms is detected in the camera FoV;
    - d. Active shooter detection – is triggered when a person extending their arm forward parallel to the floor is detected in the camera FoV;
    - e. Handrail holding detection – is triggered when a person in a given zone does not hold on to any specified handrail;
    - f. Close-standing people detection – is triggered when the distance between people in the frame exceeds the minimum allowed value;
    - g. People masking – hides people in a video image, and does not trigger the alarms;
    - h. People counter – counts the number of objects in a given zone.

The metadata can also serve as a basis for the Heat Map — a color visual representation of the objects movement in the frame which allows determining where visitors stop and measuring their linger time in the areas of interest.

In addition to the video detection tools, NetFLOW Professional has the set of audio detection tools:

- a) Noise detection – is triggered by exceeding a certain threshold volume level;
- b) Silence detection – is triggered when the microphone signal disappears completely.

The powerful tools for analyzing the incoming video and audio data allow NetFLOW Professional recognize a variety of user-defined situations. One of the following actions can be selected as a response to triggering of detection tools or security sensors connected to the cameras:

- a. Start recording of the video from the camera (with sound);
- b. Trigger an alarm;
- c. Send an SMS-message to one or several phone numbers;
- d. Send an email to one or several addresses;
- e. Play an audio announcement;
- f. Send a signal to an actuating device (relay) connected to the camera;
- g. Launch external program on Clients;
- h. Arm/disarm a video camera;
- i. export snapshots or video;
- j. Switch to layout;
- k. Rotate the PTZ camera in a given direction.

A properly configured system requires minimum of intervention in its work, while it is recording all the important events in the video archive and attracting the operator's attention to alarm events (i.e., events that result in switching to alarm processing mode). Process automation of the NetFLOW Professional video management system represents an indispensable aid to the operator, reducing his fatigue and preventing him from missing any important events.

### **License plate recognition**

NetFLOW Professional incorporates 3 algorithms for license plate recognition: VT, RR, and IV. Video

streams can be processed to search for and recognize license plate numbers in the frame. These license plate numbers are saved to a database and associated with the relevant recorded video. The database is searchable. License plate numbers can be compared to lists in real time, with actions performed (or not performed) depending on whether or not a license plate is found in the list. In addition, the real-time license plate recognition is available – it is an automatic, customizable real-time reaction to an identification of a recognized license plate number against an external list.

## **Face recognition**

NetFLOW Professional incorporates an algorithm for human identification and verification, based on the facial recognition as well as the age and gender estimation. The algorithm creates a database of all faces captured by video cameras and lets you search the database for similar faces. In addition, the real-time facial recognition is available – it is an automatic, customizable real-time reaction to an identification of a recognized face against an external list.

When working with WatchNET MPIX AI cameras (with Face Detection feature), NetFLOW Professional provides face detection algorithm – the face detection tool captures the faces and matches it with the search credential.

**Single camera simultaneous archive parts view (Time Slicing)** Time Slicing allows the user to set a time range for video footage and get a short video clip of all moving objects in the scene. Objects and events captured at different times are displayed simultaneously in a condensed "video synopsis". When you spot an object of interest, click to jump to playback of the corresponding video fragment.

The total number of objects displayed by Time Compressor is user-definable. Built-in display options minimize object overlap.

Time Slicing is especially convenient for viewing large archives that feature a relatively small number of active objects. Instead of spending hours scrubbing through footage, the operator can find the necessary fragment in just minutes.

## **Advanced Archive Search/Exploring (Moment Quest)**

Moment Quest allows for quick retrieval of video footage thanks to metadata stored with each image. These are all the data on objects moving in the scene which are calculated as the video is streaming and stored alongside with the footage. Within seconds, the Moment Quest system will find all records that match the user's query.

You can specify the following search criteria:

1. Motion in Area.
2. Loitering of an object in a specific area.
3. Simultaneous presence of a large number of objects in a specific area.
4. Crossing of a virtual line by an object's trajectory.
5. Motion from one area to another.

You can apply these filters to your search results:

- a. Object size
- b. Object type
- c. Object color
- d. Direction of object motion
- e. Speed of the moving object
- f. Object entry/exit from area
- g. Duration of object loitering in area

- h. Number of objects in area

### **Interactive 3D Map**

The 3D interactive map is used to visualize the secured facility, control cameras and identify camera's location. Interactive maps in NetFLOW Professional can obtain image data from graphics of the site or geospatial data from OpenStreetMap.

The map can contain icons for cameras, relays, and sensors. The area in which live video is displayed and field of view are indicated for each camera.

The interactive map allows controlling the objects from the context menus of the graphical symbols on the map showing the states of the corresponding objects.

You can use the interactive map in three modes:

1. 3D mode, in which both the map and layout are available.
2. 2D mode, in which only the map is available.
3. immersion mode, in which video is overlaid on the map.

### **Events from external systems (POS, ACS)**

NetFLOW Professional includes a range of new features for getting events from various external devices and systems: cash registers, access control systems, fire and security systems, and more.

A macro can be run when getting events from external systems.

### **Information boards**

Information boards offer a quick view of system status and events. There are three kinds of information boards, each displaying a specific type of information:

1. Events Board.
2. Health Board.
3. Counter Board.
4. Messages board.

The Web board is available – it allows displaying any given web page in NetFLOW Professional layouts.

### **Web and mobile client live view**

NetFLOW Professional video management software has the web-client and clients for mobile devices on the basis of Android, Windows Mobile and iOS operation systems, including Apple TV. These clients allow viewing live-video and archive when they are connected to the Server.

### **NetFLOW APP**

NetFLOW APP – connects to your NetFLOW Professional server via Internet. It is safe — your traffic is protected with SSL-encoding. In addition, NetFLOW APP provides a reporting subsystem for building more than 10 types of reports.

# 1 Video Management Software

- 1.1. The VMS shall be a highly scalable professional level software solution.
- 1.2. The VMS will offer a complete video surveillance solution that will be scalable from one to hundreds of cameras that can be added on a unit-by-unit basis.
- 1.3. The VMS shall possess a Client–Server architecture.

The VMS Server shall be a system service providing the following functionality:

- a. Configuration of all VMS components
- b. Video surveillance in four modes: Live Viewer, Alarm Viewer, Archive Viewer, Archive Search (Advanced Archive Search/Exploring)
- c. Interactive 3D map
- d. Alarm Monitoring and System Log
- e. Web Server
- f. Video Analytics
- g. A set of utilities (activation, support, log management, watermark check)

The Client VMS provides access to the functionality provided by the Server.

- 1.4 The VMS incorporates the Failover. A backup server comes online in case of a failure in any running server.
- 1.5 The VMS supports automatic time synchronization between servers.
- 1.6 All video streams supplied from analog cameras or IP cameras shall be digitally encoded in MPEG-4, M-JPEG, H.264, H.265, Hik264 or MJPEG compression formats and recorded simultaneously in real time.
- 1.7 The VMS supports the following audio compression algorithms: PCM, ADPCM, g711, g726, aac, mp2.
- 1.8 The VMS supports Intel Quick Sync Video technology, available on some Intel processors, that provides hardware acceleration for video encoding/decoding. With the help of this technology, NetFLOW Professional can process video more quickly and efficiently.
- 1.9 The VMS shall use two independent streams from camera or IP encoder: one for visualization and one for recording. All settings for each stream including resolution, codec type, frame rate and compression level may be chosen independently without affection overall system performance and IP device functionality.
- 1.10 Each camera's bit rate, frame rate and resolution will be set independently from other cameras in the system, and altering these settings will not affect the recording and display settings of other cameras.
- 1.11 The VMS shall require no proprietary recording hardware, no hardware multiplexer or time-division technology for video or audio recording and monitoring.
- 1.12 The VMS shall be based on a true open architecture that shall allow for use of non-proprietary PC storage hardware that shall not limit the storage capacity and shall allow for gradual upgrades of recording capacity.



- 1.13** The VMS shall be able to use multiple CCTV keyboards and joysticks (with USB connection type) to operate the entire set of cameras throughout the system, including cameras of various manufacturer's brands, including their PTZ functionalities.
- 1.13.1** The VMS shall support the following brands of IP cameras: 360Vision, 3S Vision, A-MTK, Abron, ABUS, ACTi, Acumen, Adino, AEvision, Alinking, Amatek, AMG, Ampleye, ANDY, Anviz, Arecont Vision, ARH, Arlotto, Asoni, ASTR, Astrohn, Aver, Avigilon, AVTech, Axis, AxyCam, Balter, BAS-IP, Basler, BestDigital, Beward, Bolin Technology, BOLID, Bosch, Brickcom, BSP, Cametron, Canon, Cellinx, Certis, Cisco, CNB, ComOnyx, Compotrol, CP Plus, D-Link, Dahua, Dallmeier, Digiever, DiGieyes, Digimerge, Dynacolor, EasyN, Eneo, Etrovision, ETZ, Euresys, EverFocus, Everview, eVidence, EVS, FineCCTV, FlexWatch, Flir, G4S, Ganz, Ganz ZNC, GeoVision, Glosav, Grandstream, Grundig, Gunnebo, Hanwha Techwin, HawkEye, Hikvision, HiWatch, Honeywell, Huawei, Hunt, iCanTek, IDIS, Infinity, Infinova, Infralan, InMotion, Intellico, IPS, IPTRONIC, iPUX, IRLab, IQinVision, iZett, J2000IP, Jassun, JVC, Legrand, LevelOne, LG, LTV, Magic Box, MAGO, Mango DSP, March Networks, Master, MBK, Mediatronix, Merit Lilin, Messoa, MicroDigital, Milesight, Mobotix, MOXA, NEXCOM, NexusIP, Novus, OMNY, Oncam Grandeye, Optelecom-NKF, Optimus, Panasonic, Partizan, Patronus Laboratories Corp., Paxton, Pelco, Pinetron, PixEYE, Planet, PRESENTCO, Probe, PROvision, Q-cam, Qihan, QNAP, RIVA, ROKA, RVi, Santec, Sanyo, SEEnergy, Sentry360, SimpleIP Cam, Sinkross, Smartec, Smartec\_G2, SNR, Sony, Spark, Spezvision, ST, StarDot, Stkomplex, STORM, Stream Labs, Stretch, Sunell, Sunkwang, Surveon, SVPlus, Takex, Tamron, Tantos, Tattile, TBK, TEDD\_G1, Tiandy, Tibbo, TRENDnet, True IP, TruVision, TVHelp, TVT, UDP, Uniview, V1netIP, Veilux, Vesta, Videosec, Videotec, ViDigi, VIDO, Visiocom, Vision, Visualint, Vitek, VIVOTEK, VMsistemas, WuT, Xenics, XeronVision, Y-cam, Youngkook, Yuan, Yudor Technologies, Zavio, ONVIF, WatchNET.
- 1.13.2** The VMS supports connection over the ONVIF Profile S, ONVIF Profile G, ONVIF Profile T, PSIA and RTSP standards.
- 1.14** The VMS can get events from diverse external hardware and systems – cash registers, access control devices and third-party software.
- 1.15** The VMS consists of the Server and Client.
- 1.16** Audio and Video storage configuration for the SSM shall either be:
- a. RAID configuration and Internal or external IDE organized.
  - b. RAID configuration or Internal or external SCSI/Fibre Channel organized.
- 1.17** The Server shall not limit the actual storage capacity configured per server.
- 1.18** The VMS support for widescreen displays and cameras, and touch screen displays.

## **2 SERVER**

- 2.1** The VMS Server is a system service providing the following functionality: Configuration of all VMS components, video surveillance in four modes: Live Viewer, Alarm Viewer, Archive Viewer, Archive Search (Advanced Archive Search/Exploring), Interactive 3D Map, Information boards, Event Control and the System Log, Video Analytics, a set of utilities (activation, support,

log management, watermark check).

- 2.2** The Server shall offer the capability to be installed on several PCs to enable distributed archiving in a LAN or WAN environment. The Server shall not limit the number of PCs which can be networked together to form a distributed archive server system.
- 2.3** TCP and UDP server-to-client video streaming. Multicasting and unicasting UDP server-to-client video streaming.
- 2.4** Server selects ports from a fixed range, which is set during the installation of VMS.
- 2.5** The VMS shall support multiple Servers connections. Each Server shall belong to specific servers' group specified by user. Connection between different Servers shall be done automatically if these Servers belong to the servers' group with the same name. Servers which belong to same servers' group shall share their configuration database between each other and shall provide client application with access to any device (camera, server) related to this servers' group regardless which server was point of initial client application connection to the system.
- 2.6** Each part of the system that contains a Server can operate independently.
- 2.7** The Server shall give the capacity to view all DVS in a network even if the DVS are assigned to different archive servers.
- 2.8** The Server, in the case that a camera signal is lost, shall detect the video loss and have the capability to alert the systems administrator.
- 2.9** The Server shall receive all incoming events (motion detection and triggered digital input and relay output) in the system and take appropriate actions based on user-defined event/action relationships.
- 2.10** The Server shall create an audit trail of events and user activities.
- 2.11** The Server shall authenticate users and give access to the VMS based on predefined user access rights.
- 2.12** The VMS shall allow users to connect to multiple Servers. Their access rights could be determined on a per Server basis or per servers' groups basis.
- 2.13** At each Server launch, the integrity of all executive files is checked for compliance with a digital signature.
- 2.14** Each Server uses a self-diagnostics service that tests the operability of NetFLOW Professional's internal components, and launches pre-specified actions in case of emergency.
- 2.15** The Server shall keep a log of the following events:
  - 2.15.1** Information messages
    - a. Camera recording to archive started
    - b. Camera recording to archive completed
    - c. Start time of detection tool trigger
    - d. End time of detection tool trigger
    - e. Archive: Start of export process
    - f. Archive: End of export process
    - g. Camera connected
    - h. Camera disconnected

- i. Restart (camera)
- j. Signal restored (camera)
- k. Manipulation (camera)
- l. Switch to preset (camera)
- m. Relay opened/closed
- n. Send SMS to phone number
- o. Audio file played
- p. Playback of audio file is paused
- q. Server switches to backup power supply
- r. Server connected/disconnected
- s. PTZ camera control

#### **2.15.2 Error messages**

- a. Export failed
- b. Could not apply settings (camera)
- c. Authorization failed (camera)
- d. Internal error (camera)
- e. Network failure (camera)
- f. Signal lost (camera)
- g. Cannot switch to preset (camera)
- h. Cannot perform automatic rule (camera)
- i. Archive partition error
- j. Emergency shutdown of recording to the archive

#### **2.15.3 Alarm messages**

- a. Change in alarm status: alarm resolved by user
- b. Alarm is pending
- c. Change in alarm status: alarm is being processed
- d. Alarm not accepted for processing
- e. User cannot start alarm processing. This alarm is being processed by another user.
- f. Alarm initiated by automatic rule
- g. Alarm initiated by user

#### **2.15.4 Debugger Information**

- a. Automatic rule start
- b. Automatic rule end

#### **2.15.5 Operator actions.**

**2.15.6** IP-address of the event is added to every user event. Also, the MAC-address of the computer is added to the system log on every Server login.

**2.15.7** The Server shall automatically record audio and video for the following events:

- a. Alarm is initiated manually
- b. Detection tool is triggered
- c. Sensor is activated

**2.15.8** The Server shall allow for multiple recording schedules to be assigned to a single camera; each schedule shall be created with the following parameters for.

#### **2.15.9 Video quality settings:**

- a. Resolution
- b. Frame Rate
- c. Bit Rate

**2.15.10** Recording Mode:

- a.
- b. Continuous recording
- c. Alarm recording
- d. Scheduled recording
- e. Recording off

**2.15.11** Time and date settings:

- a. Daily
- b. Weekly
- c. By flexible schedules

**2.16** Server skips frames to be recorded if there is not enough disk space.

**2.17** The Server shall support Advanced Alarm Management, which shall have the ability:

- a. To assign alarms and procedures to specific users or user groups
- b. To allow a user to queue alarms, and view alarm history

**2.18** The Server analyzes video and generates metadata. Server supports metadata from IP devices.

**2.19** Archives configuration and management.

**2.19.1** The Server shall support Windows-independent file system to avoid fragmentation of hard drive part intended for archive use and access of Windows applications to archive files. Communication between System Core and archive file system shall be processed on low level without involvement of any Windows application.

**2.19.2** VMS video archive can be created at designated part of the hard drive, in existent partition, at specially assigned partition or at dedicated hard drive completely reserved for video archiving.

**2.19.3** An archive can be stored both on a local disk and on NAS devices.

**2.19.4** File system used for video archive recording shall not be affected by hard disk cluster/sector damage and this sector shall be ignored by System Core for further usage to avoid possible harm for archive integrity.

**2.19.5** User shall have possibility to create unlimited number of virtual archives in the system with ability to add certain cameras to specific archives with different recording parameters without affecting overall system performance, archiving effectiveness and cameras general functionality.

**2.19.6** NetFLOW Professional can view video stored on external disks that are connected directly to video cameras (Edge Storage).

**2.19.7** Replication of video footage between archives. Replication can be automatic or it can be started manually.

**2.19.8** Auto copying the archive and camera events from local Servers that are not in the same NetFLOW domain with the central Server.

**2.20** System configuration.

The system is configured by the administrator or users with the corresponding access rights. System configuration refers to the following:

- 2.20.1** Configuring the distributed architecture and combining Servers into an NetFLOW domain.
- 2.20.2** Automatic search and addition of unassigned hardware and Servers.
- 2.20.3** Configuring the web server: control of startup, authentication, etc.
- 2.20.4** Creating and configuring system hardware objects: cameras (including fisheye) and their sensors, relays, speakers, microphones, and PTZ units.
- 2.20.5** Digest HTTP-authorization is enabled when connecting to device.
- 2.20.6** Changing video stream parameters: compression level, frame rate, video codec etc.
- 2.20.7** Setting the video buffering and setting the buffer size.
- 2.20.8** Configuring streams for multi stream-supporting cameras. Selecting the stream for displaying, configuring the stream for recording to the archive. Configuring adaptive video stream.
- 2.20.9** Changing audio stream parameters: audio codecs, bit rate, I/O mode, etc.
- 2.20.10** Group application of camera settings.
- 2.20.11** Combining cameras into groups and limiting access to particular groups on the web server.
- 2.20.12** Configuring a privacy mask for a specified area of the frame in real time mode.
- 2.20.13** Putting a text over the video image.
- 2.20.14** Configuring SMS, email, and audio notification.
- 2.20.15** Creating and configuring archives: placement of an archive in a file or on an entire logical disk, configuration of recording to an archive, selection of the mode for recording to an archive, pre-alarm recording functionality. Configuring the archive recordings protection from overwriting.
- 2.20.16** Configuring time zones. Video archive can be recorded as well as macros can be run by time zones.
- 2.20.17** Configuring detection: configuration of core audio and video detection tools: video image degradation, change in camera position, start of motion in frame, signal threshold exceeded, absence of signal, and noise. Visual setup of detection tools. Configuring the recording of the object trajectories received from the motion detection tool to the database (tracking).
- 2.20.18** Configuring the smoke and fire detection tools. Configuring the neural network.
- 2.20.19** Configuring the pose detection tools: recumbent person detection, sitting person detection, hands up detection, active shooter detection, handrail holding detection, close-standing people detection, people counter, people masking. Configuring the neural network.

- 2.20.20 Configuring the equipment detection (PPE). Configuring the neural network.
- 2.20.21 Configuring the privacy mask. Configuring the neural network.
- 2.20.22 Configuring situation analysis: configuration of detection tools for motion start/stop, loitering, object appearance and disappearance, abandoned objects and line crossing, multiple objects in the area, writing of object trajectories to the database (tracking). Configuring the neural network filter. Configuring the neural network-based object tracker.
- 2.20.23 Configuration of ANPR / LPS: select the country, set the sensitivity of recognition. Recognition in extreme weather conditions (rain, snow). Receiving the recognized LP numbers from the camera embedded detectors.
- 2.20.24 Configuration of the retail analytics: queue and visitor counting detection.
- 2.20.25 Configuration of the water level detection.
- 2.20.26 Configuration of embedded analytics on cameras (if integrated).
- 2.20.27 Mass configuration of detection tools of the same type.
- 2.20.28 Macros: configuring system reactions to any events that may occur, the user can create macros that include an unlimited number of actions such as:
  - Waiting for event, timeout or when the previous action finishes
  - Recording to the archive
  - Start replication
  - Alarm triggering
  - Alarm handling
  - Arm/disarm camera
  - Relay switch
  - Going to PTZ camera preset
  - Going to the layout and restoring the previous layout
  - Frame and video export
  - SMS and email notification
  - Audio notification from the Client
  - Audio playback on the Client
  - Audio playback on the Server
  - External program start
  - Start/stop the slideshow of layouts on the operator's monitor
  - Check for the archive presence
  - Switch to forensic search results in the archive
  - Objects enabling/disabling
  - Launching another macro
  - Resolving a web request

A macro can be run automatically (depending on time or when an event is received) or manually. Actions in a macro can be performed once or unlimited number of times (cyclically).

Events that can trigger macros:

- Server connected
- Server disconnected

- Recording started
- Recording stopped
- Camera armed
- Camera armed (restricted)
- Camera disarmed
- Relay triggered
- Alarm initiated
- Alarm being processed by user
- Alarm skipped
- Alarm processed
- Alarm processed – **Critical alarm**
- Alarm processed – **non-critical alarm**
- Alarm processed – **False alarm**
- Camera disconnected
  - Camera connected
  - Signal lost
  - Signal restored
  - Triggering start
  - Triggering end
  - Detector triggering
  - Face detection specified triggering (the ability to filter by gender, age and body temperature)
  - Archive partition error
  - Archive partition restored
  - Beginning of time zone
  - End of time zone
  - The specified CPU load limit is exceeded
  - The specified RAM load limit is exceeded
  - The specified network load limit is exceeded
  - The free disk space has decreased to the specified limit
  - The free archive space has decreased to the specified limit

**2.20.29** Configuring users and roles. Each user belongs to a defined role. The role governs the level of access of its users to settings and management of the system and hardware. LDAP-based authentication. User security policy support: minimum password length, password complexity level, password history storage, password expiration date, prevention of multiple logins of the same user account, account lock in case of a failed password entry.

**2.20.30** General Data Protection Regulation (GDPR): masking faces on video, hiding any objects on archive recordings, adding privacy mask on real-time video.

**2.20.31** Configuring storage of the system log and metadata: setting of the period for storage and clearance, as well as archive capacity.

**2.20.32** Export features: folders and export formats can be selected as well as recompression parameters can be set, limit the size of exported video and PDF-export template can be configured, etc.

**2.20.33** Configuring alarm evaluation mode: setting of the alarm hot time and requirement for comments when classifying alarms.

**2.20.34** Configuring client interface: choice of localization, calendar type, type of timeline and

layouts ribbon, display of hints/tooltips, hiding of toolbars, animations, display of video streams properties in viewing tiles, viewing tile view, etc.

**2.20.35** Configuring client startup: use of the client instead of the OS shell, configuration of automatic identification on client start.

**2.20.36** Configuring layouts: creating new layouts, creating layout groups and subgroups, adding cameras and information boards to layouts, merge viewing tiles (Frame merge), and linking layouts to maps, sharing user layouts with each other (any layout can be sent to the monitor of any client computer that is part of the same distributed video surveillance system). Special layouts: layout with selected video cameras and layout displaying the cameras with active alarms, dynamic layout. Default layout.

**2.20.37** Configuring interactive maps: selecting a map type (static image or OpenStreetMap geodata), selecting the users who can access the map, adding cameras to maps, adding sensors and relays to maps, adding jumps to other maps, configuring display of video feeds on maps, configuring links between video feeds and maps in immersion mode.

**2.20.38** Configuring screens on a multi-monitor workstation: activation of additional monitors in the system, configuration of layouts on additional monitors (no SW limitation for number of monitors). Configuring the videowall.

**2.20.39** Configuring hot keys: operate NetFLOW Professional using special keyboard controllers and joysticks.

**2.20.40** Configuring PTZ device control: PTZ devices are controlled according to set priority.

**2.20.41** The configuration of NetFLOW domain can be saved and restored.

## **2.21** Real-time video surveillance.

**2.21.1** Simultaneous viewing of video in real time (live) from multiple cameras (there is no restriction on the number in the current version).

**2.21.2** GreenStream: automatic switching to high quality video stream when selecting a viewing tile.

**2.21.3** Access to system information via information boards: status of servers and cameras, information about system events and event statistics.

**2.21.4** Viewing video with superimposed titles (events from external systems).

**2.21.5** Auto-replace offline cameras with standby cameras on layouts.

**2.21.6** The User can start macros from Message Board.

**2.21.7** Scaling of viewing tiles and digital zoom. Virtual telemetry (dewarping the image into Regional/Single View) for fisheye cameras.

**2.21.8** Functions for object tracking and autozoom: highlighting / outlining and focusing on moving objects.

**2.21.9** Tag & Track Lite feature: predicting the camera in front of which an object will appear



after it leaves the field of view of another camera.

- 2.21.10 Tag & Track Pro feature: getting the "big picture" of everything happening at a protected site while obtaining detailed imagery of the objects moving around it.
- 2.21.11 Display of camera sensor status and relay control directly from a viewing tile.
- 2.21.12 Video image processing: application of contrast, sharpness, deinterlacing.
- 2.21.13 Video can be rotated by 90, 180 or 270 degrees.
- 2.21.14 The user can comment and export video to MKV, MP4, EXE and AVI formats with one click. Frames are exported to PDF and JPG formats. Export to password protected ZIP format archive. Confirmation of the export by the system administrator.
- 2.21.15 Selection of a layout for display on the monitor, selection of cameras for display in each viewing tile. When connecting to multiple NetFLOW domains, layouts of all domains are available. Special layouts: all cameras with active alarms and all tagged video cameras.
- 2.21.16 Manual initiation of alarms by the operator; arming/disarming of cameras. Cameras are not available for users with restricted access in the Arm in private mode state.
- 2.21.17 Control of a PTZ camera using the PTZ control panel.
- 2.21.18 Setting and use of PTZ camera presets.
- 2.21.19 Control of focus, iris, and optical zoom by using the corresponding controls.
- 2.21.20 Activation of patrol mode / camera tour: automatic change in position of a camera according to the route provided by the list of camera presets.
- 2.21.21 PTZ control both with a virtual joystick and with a standard PC-connected joystick.
- 2.21.22 Onscreen PTZ: PTZ control using the mouse in the viewing tile.
- 2.21.23 Area zooms and Point & Click.
- 2.21.24 Using presets earlier created on the device.
- 2.21.25 Snapshot.

## 2.22 Video monitoring in alarm evaluation mode.

- 2.22.1 Automatic (when a detection tool is triggered) and manual alarm initiation.
- 2.22.2 Ability to replay alarm events (PiP). Quick jump to the start of an alarm event.
- 2.22.3 Operator evaluation of alarms on a three-point scale: critical, safe, false alarm. Each alarm status corresponds to a particular color in the archive. Unclassified alarms are marked and tagged as missed. For a particular alarm, alarm evaluation is available only to the operator who first switched to alarm evaluation mode.
- 2.22.4 Playback of an alarm event at different speeds, forwards and backwards.
- 2.22.5 Display of the reason for the alarm: name of the detection tool or user who initiated

the alarm.

**2.22.6** Standard video surveillance functions: digital video zoom, video image processing, export of snapshots and video.

**2.23** Video surveillance in Archive Viewer.

**2.23.1** Ability to play back audio and video recordings from any time range.

**2.23.2** Quick selection of a camera and archive for viewing video.

**2.23.3** Ability to play back archived video from multiple cameras in sync. Simultaneous playback of video footage for multiple cameras and viewing other cameras live.

**2.23.4** Automatic consolidation of video recordings from different sources.

**2.23.5** Viewing video from SD cards (edge storage).

**2.23.6** Viewing recorded video with superimposed titles (events from external systems).

**2.23.7** Addition of comments to snapshots and intervals. Browsing of recorded video with comments.

**2.23.8** Navigation within the archive by using two timelines (synchronized): horizontal (matches the selected camera) and vertical (for all cameras that are in archive mode (Archive Viewer)).

**2.23.9** Keyboard-based navigation of the archive.

**2.23.10** Navigation in recorded video via list of events: filtering of events by category and cause, quick switching between alarm recordings.

**2.23.11** Fast/slow motion forward/backward playback.

**2.23.12** Tag & Track Lite feature: predicting a camera in the field of view of which the object that left the field of view of the current camera can appear.

**2.23.13** "Compressed" viewing of the archive (single camera simultaneous archive parts view): display of tracking objects from different times in the selected portion of the archive; ability to quickly view the archive to spot important events.

**2.23.14** Video can be converted to MKV, EXE and AVI formats. Frames are exported to PDF and JPG formats. Comments can be added as well as masks and export areas can be set. Export is performed simultaneously from multiple cameras to different files.

**2.23.15** Object tracking and autozoom: highlighting / outlining and focusing on moving objects.

**2.23.16** Display during recorded video playback of the cause of detection tool

triggering.

**2.23.17** Standard video surveillance functionality: digital video zoom, video image processing.

**2.24** Video monitoring in Archive Analysis Mode:

**2.24.1** Seven types of searches of recorded video: Events Search, Advanced Archive Search/Exploring (Moment Quest), Time-Based Search (Thumbnail Search), Search by Operator Comments, Face Search, License Plate Search, Search events from external systems.

**2.24.2** Analysis of the archive as a whole or of a selected part.

**2.24.3** Search for events by category, trigger cause, and initiator.

**2.24.4** Split the archive or a selected portion into equal-sized video fragments of the specified length (Time Slice).

**2.24.5**

**2.24.6** Advanced Archive Search/Exploring (Moment Quest) set filters, such as:

- Object type
- Minimum and maximum object size
- Object color
- Minimum and maximum movement speed of an object
- Direction of object motion
- object entry/exit from area
- duration of object loitering in area
- number of objects in area

and search criteria, such as:

1. motion in Area
2. loitering of an object in a specific area
3. simultaneous presence of a large number of objects in a specific area
4. crossing of a virtual line by an object's trajectory
5. motion from one area to another

**2.24.7** Search for recorded scenes based on operator comments.

**2.24.8** License Plate Search.

**2.24.9** People can be searched by photo in the FR database. Displaying all recognized faces. Displaying all recognized faces when using a WatchNET MPIX AI camera (with Face Detection feature). Instant export of a facial image from the scene.

**2.24.10** Telling “friend” from “foe” while face search is performed – analyzing how often the

face was captured by cameras.

**2.24.11** Simultaneous search by all cameras in the NetFLOW-domain.

**2.24.12** Search events from external systems.

**2.24.13** Playback of found fragments in a viewing tile. Playback controls are the same as in Archive Viewer. Viewing several seconds before alarm.

**2.24.14** Accelerated viewing of search results in the Time Compressor mode.

**2.24.15** In found scenes, enlargement of the object that triggered the detection tool. The object which caused the trigger is outlined with a red frame.

**2.24.16** Offline Analytics. Ability to run analytics (Moment Quest forensic search, face search, LPR search, compressed playback of archive – Time Slicing) on external video footage.

**2.24.17** Video can be converted to MKV, EXE and AVI formats. Frames are exported to PDF and JPG formats. It is possible to watermark and add comments as well as set masks and export areas. Export is performed simultaneously from multiple cameras to different files. Export of video with reduced frame rate. File size limitation during export. Automatic printing frame during export.

**2.24.18** Tracking functionality: moving objects are highlighted when found fragments are played back.

**2.24.19** Standard video surveillance functionality: digital video zoom, video image processing.

**2.25** Interactive 3D map.

**2.25.1** Display of the map in 3D; when the map is open, the layout is also present on a video surveillance screen.

**2.25.2** View of camera video on the map, adjustable transparency of video feeds on the map.

**2.25.3** Search by the geo map.

**2.25.4** Automatic position change of cameras with geo-tracker on geo maps.

**2.25.5** Ability to change plane tilt, map scale, and focus; display of the map in 2D. Automatic map scaling and focusing to an alarm camera.

**2.25.6** Control of devices from the map (cameras and relays) and display of status of devices (cameras, relays, sensors).

**2.25.7** Immersive map mode (as well as for fisheye video cameras):

- If links have been created between video and the map, an angle will be chosen so that objects in the video match the objects as depicted on the map.
- If links have not been created, the map is shown so that the video is located in the field of view specified for the camera on the map.

**2.26** Audio Monitoring

- 2.26.1 Listening to sound from a microphone in real time.
- 2.26.2 Playing back sound in the archive.
- 2.26.3 Controlling sound volume.
- 2.26.4 Playing back sound from Client microphone on camera speaker(s).

## 2.27 System Log

- 2.27.1 Search for events based on specified conditions: time interval of event occurrence, type of event, key phrase. Five types of events: System health event, Error event, Alarm event, Debug information, Operator actions.
- 2.27.2 Events are shown in the form: date and time, type, description.
- 2.27.3 Export of a list of events to a .txt file.
- 2.27.4 Ability to quickly jump to video of an event.

## 2.28 Set of utilities

- 2.28.1 The activation utility is made for operations with the VMS license. Automatic activation of a paid license by serial number. If no Internet connection is present, a file with an activation request is created. Expansion of VMS functionality by using license updates.
- 2.28.2 Utility for collecting system information: collection of information about hardware status and configuration. This information is necessary when contacting technical support.
- 2.28.3 Utility for log management: settings for archives of external logs and logging levels of the VMS Server and Client.
- 2.28.4 Utility for watermark verification: verification of the watermark added during export of snapshots and video.
- 2.28.5 Configuration management utility: the configuration of NetFLOW domain can be saved and restored.
- 2.28.6 NTServiceOpts utility: setting the port range for operation of the NetFLOW Professional Server and configuring the network.

## 3 CLIENT

The Client is an application with an interface that gives access to the functionality provided by the Server.

### 3.1 Client connection to the Server.

3.1.1 The Client shall support the following forms of connections over IP: LAN, VPN.

3.1.2 Secure connection between The Server and Client Software Application shall be provided

via virtual private network (VPN) technology to avoid possibility of unauthorized connection to get access data or video stream.

- 3.1.3** The Client can connect to any available Server.
- 3.1.4** Authentication must be performed when attempting to connect to the Server. The four-eye principle is used for authentication.
- 3.2** It is now possible to simultaneously connect to multiple servers on the same or different domains.
- 3.3** Filtering of IP-addresses from which remote Clients can connect to the Server.
- 3.4** Multiple Clients can be run on one computer in order to connect to different Servers.
- 3.5** Server functioning continues if the Client is unloaded: writing to the archive, detection, event logging, etc. continue.
- 3.6** Boundaries of the Client interface: users have access only to the indicated system features.
- 3.7** The computer on which the Client is started must use a CCTV controller or standard PC keyboard to control cameras.
- 3.8** An unlimited number of Clients can connect to a single Server.
- 3.9** The Client can be started in full screen or window mode.

## **4 WEB CLIENT**

The VMS Web Client provides remote access to the Server over the Internet. Viewing video in Motion JPEG, H.265 and H.264.

- 4.1** Secure HTTPS connection.
- 4.2** Authentication of users connecting to the Web Server in accordance with user rights on the Server.
- 4.3** Video surveillance in three modes: Live Viewer, Archive Viewer, Archive Search.
- 4.4** Searching in the archive for several cameras simultaneously.
- 4.5** Viewing the alarms.
- 4.6** Creating the Heat Map.
- 4.7** Generating reports by search.
- 4.8** Creating layouts.
- 4.9** Selecting video stream and playback format.
- 4.10** Real-time control of PTZ cameras: presets, optical zoom, control of pan / tilt angle and positioning speed, point & click.
- 4.11** Audio playback.
- 4.12** Digital zoom in both Live and Archive Viewer.

- 4.13 Frame and video export.
- 4.14 System events.
- 4.15 Video cameras statistics.
- 4.16 Working with bookmarks.

## **5 MOBILE CLIENTS VMS**

VMS Client for Android, Windows Mobile and iOS operation systems allows connecting to the Server via Internet connection.

- 5.1 Android, Windows Mobile and iOS Clients are free for downloading on Google Play, Microsoft store and on App Store respectively.
- 5.2 Authentication of users connecting to the Web Server.
- 5.3 Connection via NetFLOW HUB.
- 5.4 Video surveillance in three modes: Live Viewer, Archive Viewer and Face Search in the archive.
- 5.5 Using fisheye cameras in the de-warp mode.
- 5.6 Audio playback.
- 5.7 Playing sound from a mobile device on the Server speakers.
- 5.8 Getting information about alarm events and going to the archive video recorded during an event.
- 5.9 Control of PTZ cameras (including activation of presets).
- 5.10 Digital zoom.
- 5.11 Working with geomaps.
- 5.12 Run macros.

## **6 NetFLOW HUB**

VMS cloud service.

- 6.1 Guarantee of secure connection to the web server.
- 6.2 Working with the web client.
- 6.3 Sending e-mail messages when the macro is triggered.
- 6.4 Sending push messages to mobile Clients.
- 6.5 Viewing exported frames and videos.
- 6.6 Configuring a failover system.
- 6.7 Creating the lists of facial templates.
- 6.8 Creating the lists of vehicle numbers.

**6.9** Creating users and roles.

**6.10** Report subsystem:

**6.10.1** Demographic report.

**6.10.2** Visitors report.

**6.10.3** Visitors report by cameras.

**6.10.4** Queue length report.

**6.10.5** Face lists report.

**6.10.6** Report on the number of persons recognized.

**6.10.7** Interval report on the number of persons recognized.

**6.10.8** Report on people without masks.

**6.10.9** LPR lists report.

**6.10.10** All vehicles report.

**6.10.11** Report on vehicles in the parking lot.

**6.10.12** Report on the violation of the social distancing.

**6.10.13** Report on fever-screening events.

**6.10.14** PPE On/Off report.

**6.10.15** Report on all violations of PPE regulations.

**6.10.16** Alarms report.

**6.10.17** Line crossing report.