

# **SMTS – Security Town Management System Version 1.0- Architectural & Engineering Specifications**

# PHYSICAL SECURITY INFORMATION MANAGEMENT

## PART1. OVERALL DESCRIPTION

### 1.1 SUMMARY

The STMS – Security Town Management System is a high scalable and intelligent video surveillance platform processed through a flexible hardware & software architecture, mainly destined for cities, states and public forces, allowing to create a robust and integrated processing center which prevents, detect and treat several events.

The software is divided into different modules, that can or cannot be deployed at same time or in further system's growth.

### 1.2 REFERENCES

- a) Abbreviations and Acronyms:
  1. ACC: Advanced Audio Coding.
  2. AGC: Automatic Gain Control.
  3. AES: Advanced Encryption Standard.
  4. API: Application Programming Interface.
  5. BLC: Back Light Compensation.
  6. DES: Data Encryption Standard.
  7. DVR: Digital Video Recorder
  8. FPS: Frames per Second.
  9. Full HD: High Definition video resolution of 1920 x 1080 pixels.
  10. GB: Gigabyte.
  11. GIS: Geographic Information System.
  12. GOP: Group of Pictures.
  13. H.264/H.265: Video compression formats.
  14. HD: High Definition video resolution of 1280 x 720 pixels.
  15. HLC: High Light Compensation.
  16. HTML: Hyper Text Markup Language.
  17. HTTP: Hyper Text Transfer Protocol.
  18. HTTPS: Hyper Text Transfer Protocol Secure.
  19. I/O: Input/Output.
  20. IP: Internet Protocol.
  21. JPEG: Joint Photographic Experts Group (image format).
  22. LAN: Local Area Network.
  23. LPR: License Plate Recognition.
  24. Micro SD: Removable Miniaturized Secure Digital Flash Memory Card.
  25. MPEG: Moving Picture Experts Group (video format).
  26. NAS: Network Attached Storage.
  27. NAT: Network Address Translation.
  28. NIC: Network Interface Controller.
  29. NVR: Network Video Recorder.
  30. ONVIF: Open Network Video Interface Forum.
  31. PoE: Power over Ethernet.

32. PTZ: Pan-Tilt-Zoom.
33. QoS: Quality of Service.
34. RTSP: Real Time Streaming Protocol.
35. SDK: Software Development Kit.
36. SNMP: Simple Network Management Protocol.
37. UPS: Uninterruptible Power Supply.
38. VMS: Video Management Software.
39. WAN: Wide Area Network.

## **PART2: SYSTEM MODULES**

### **2.1 SUMMARY**

The STMS modular architecture brings the “AasG – Add as you grow” concept, allowing to design exactly according to demand. It features a multi-server and multi-site video surveillance system with power of choose, capable of reaching wide proportions and designs.

The modules that integrates the system are:

- Monitoring and video Processing Module;
- Intelligent Vehicle and Traffic Classification Module;
- Objects Oriented Video Structure and Classification Module;
- Dispatch & Action Module;
- Audit, Health & Management Module;
- Smart Sensors and Automation Module;

### **2.2 MONITORING AND VIDEO PROCESSING MODULE**

- A) SMTS is an IP based open source platform that integrates computer hardware, network and security devices, data storage and analysis systems from different sources.
- B) The system is able to federate remote sites and sub-systems for allowing distributed video surveillance and also enable cloud access to storage videos, pictures and metadata.
- C) In the same way, collects information from different sources to make correlation of the data, events and alarms, allowing operators to make decisions faster and more effective, avoiding false positive.
- D) The platform provides access to a huge amount of devices simultaneously, including video channels from IP and analog cameras (since these cameras are connected to Digital Video Recorders, Hybrid devices, encoders / decoders) and also processes several video channels of analytic intelligent video cameras.

- E) The platform is compatible with various types of video codecs such as MJPEG, MPEG4, H264 and H265.
- F) The platform is also able to send and receive audio using codec such as AAC, G711, G722.1, G726.
- G) The system supports video recording of all video channels using different servers as needed.
- H) To avoid problems related to network outages or performance, the system also provides load balance and dynamic fault tolerance.
- I) Live View functions:
  1. Minimum 64 channels can be monitored at the same time;
  2. 1, 4, 6, 8, 9, 13, 16, 20, 25, 36 and 64 screen divisions;
  3. Screen customization;
  4. Real time snapshot;
  5. Real time video backup (live or playback);
  6. Video backup from monitoring screen (user can choose channel, data and time period);
  7. At least 04 monitors can be used in a same client server;
  8. Live, playback and map can be shown among monitors at the same time;
  9. Event alarm can be seen in the live view monitoring;
  10. Easily allows operator to change live view to playback;
  11. Supports fast sorting: all channels, Online, Offline;
  12. Supports display of all channels;
  13. Supports quick search;
  14. Supports for displaying video thumbnails;
  15. Supports display of channel information with scroll bar;
  16. Supports drag-and-drop operation for playback video;
  17. Supports timeline and calendar access to playback recorded videos;
  18. Supports play, pause, stop buttons in playback screen;
  19. Supports creation of groups of devices for each user;
  20. Supports creation of favorite devices that can be accessed by each user;
  21. Support adding channels to favorites using right mouse button;
  22. Supports device tree that allows operator to check easily which devices can be displayed;
  23. Allows operator to search devices by name, keyword, location or IP address;
  24. Device tree must be used to show name and IP address of device to make easy the operation of system;
  25. From device tree user can check and monitoring images according to permission settings;
  26. Supports open videos by double clicking groups, devices or channels;
  27. Supports cycle display: 10s, 30s, 1min, 2min, 5min, 10min;
  28. Saves monitoring channels in favorites;
  29. Support fast real-time preview, video playback and channel control for monitoring from favorites;

30. Supports more than 10 levels of favorites;
31. Supports real-time preview of video channels automatically added to history;
32. Supports quick start from the real-time preview history;
33. Groups resources according to organizational structure, real-time view of history and favorites.
34. Enables right-click on the video channel to open PTZ preset and access configuration menu;
35. Flow type selection rules can be defined locally;
36. Closes the current windows, sets screen division and stops live view using right button of the mouse;
37. Changes between full-screen mode normal-screen mode by using the mouse;
38. Adds one or more channels to favorites using only the mouse;
39. Switches between live viewing and playback with the right mouse button;
40. In the menu opened when clicking with the right mouse button, is possible to start video playback;
41. Supports adjustment of brightness, contrast, saturation and color of the image using only the mouse;
42. It must allow adjustment of focus on the image only with the use of the mouse (the user must have the necessary privileges for this operation).
43. Online data display must support:
44. Online device support: support for the display of all online video devices.

J) PTZ Control

1. Allow eight directions control
2. Allows changing of sensitivity to operate PTZ;
3. Supports Configuration \ Modification and preset deletion;
4. Supports monitoring position control;
5. Focus, zoom and aperture adjustment;
6. Supports frame selection and image enlargement using the mouse and 3D positioning as well;
7. Supports PTZ rotation function;
8. Supports mouse and joystick control,
9. Platform control lock function;
10. User can lock / unlock platform according to right management;

K) Videowall Function

1. Supports live view channels, sequence of channels or group of channels;
2. Supports screen divisions and single screen;
3. Supports audio;
4. Supports preview of videowall configuration;
5. Supports configuration of channels by drag-and-drop function;

L) Playback and Backup Functions

1. Supports local video search (client computer's hard disk or storage media);
2. Supports remote video search including storage devices in the cloud;
3. Supports easy viewing of videos recordings from a specific date and time;

4. Supports playback of all videos or only recordings from event/alarm videos
5. Supports pause, playback, stop and zoom playback operations;
6. Supports video search for playback, start and end time;
7. Splits screen in playback mode;
8. Supports independent playback for each window (mode, speed, audio, etc.);
9. Extracts a part of the video recorded and download
10. Supports download center function to see the progress of download operation;
11. Downloads recorded videos, up to five records can be downloaded simultaneously;
12. Supported formats: AVI, ASF, MP4;
13. Enables fast forwarding 2X, 4X, 8X, 16X, 32X or 64X and also slow speed playback 1 / 2.1 / 4.1 / 8.1 / 16.1 / 32.1 / 64;
14. Supports reproduction according to the color in the timeline (each color corresponds to a type of recording);
15. Supports space configuration for recording based on quota for each type of recording;
16. Enables real time video recording by using mouse right-click;
17. Adjusts the timeline progress bar by dragging with mouse;
18. Supports viewing of playback progress on the timeline and changes the size of timeline;
19. Support for 10-second scale display or bigger;

M) MAP and GIS Function

1. Supports online and offline maps;
2. Supports fitting the map on the video wall used by the platform;
3. Supports map zoom and full screen display;
4. Supports Information display in the map;
5. Supports surface measurement, reset, screen cleaning and marking;
6. Displays the tree structure to show all videos, channels and organizational information in addition to support of keyword search by clicking on position on the map;
7. Supports location of channels on map;
8. Opens information on the screen according to the selected camera;
9. Supports real-time video, platform control and video playback through the manipulation of buttons;
10. Supports Google map;
11. Selects channels or group of channels;
12. Supports the simultaneous selection of monitoring points in an area through frame selection, line selection, route selection, etc.;
13. Supports different icons to distinguish different types of devices;
14. Supports simultaneous opening of live view and video playback in real time for selected channels;

N) Login into the platform

1. Supports login in through the system user on the platform or through user registration;
2. The authentication is based on user name and password;
3. Supports user's login password during authentication;
4. Password encryption during authentication;
5. Supports concurrent logins;

6. Prompt for username and password when a wrong password is entered;
7. Support user's account block after 5 wrong attempts in a row;
8. Allows automatic login as long as the credential has been saved correctly;
9. After entering the IP and port for the first login, the IP and port can be automatically remembered.

O) Vehicle registration query requirements:

1. Supports search vehicle's passage information according to the time, license plate number, body color and other conditions;
2. Supports list view mode to display vehicle ticket records;
3. Supports box and circle selection in map mode;
4. Supports search by vehicle brand and speed;
5. Displays detailed information about the vehicles that are transiting: image, number plate, capture time, car location, body color, lane number, car direction, speed and vehicle brand;
6. Support for obtaining instant images of vehicles and support for downloading photos;
7. Gets 15s of video capture, supports basic pause operations, fast forward and fast backward, supports full screen video viewing, supports download to local computer;
8. Supports switching to map mode to view vehicle trajectories
9. The following conditions can be used for vehicle search: start time, end time, license plate number, vehicle category, vehicle brand and color;
10. Support to show list mode, view mode, details, related videos and trajectories;
11. Supports fuzzy search;
12. Supports the display of instant vehicle maps;

P) The system supports graphical search using the following conditions

1. Supports vehicle photo upload to perform resource analysis;
2. Displays a type list that can support search results;
3. The system must receive information generated by ANPR camera such as: license plate number, license plate type.
4. Supports search according to the following conditions: start time, end time and checkpoint;
5. Fuzzy Control of the Plate Number;
6. Supports batch import of control information.
7. Supports real-time vehicle alert function:
8. Supports real-time display of alarm related to a ANPR camera and shows the information in the electronic map;
9. Checks details of the records related to alarm information;
10. Supports confirmation of the alarm;
11. Supports warning in real time;
12. Displays alarms details like snapshots, alarm time, transit location.
13. Allows querying of vehicle information by combining conditions for certain periods of time in specific area.

Q) Correlation and traffic analysis using vehicle characteristics and ANPR information

1. Support queries related to conditions such as:
  - a) First occurrence of a plate number / identified vehicle in a certain place;

- b) Quantity of passages of one vehicle in the same place in a period of time;
  - c) Vehicles that passes together in a same place more than x times;
  - d) Duplicated plates (two different vehicles using the same plate number at the same time);
  - e) Vehicles that passes by a certain point x times during the day and / or more than x times during the night;
2. Support search vehicles according to the following characteristics:
    - a) Color;
    - b) Brand;
    - c) Classification (van, car, bus, truck and motorcycle);

## 2.3 DISPATCH & ACTION MODULE

A) Dispatch & Action module shows an integrated dashboard which includes maps, buttons, icons, tracking lines and related functions, making possible to manage, command and control many events simultaneously, giving the user tools to have a large view and quick response to alarms, taking to the closest agent(s) the awareness about what is happening around him and giving him support on resolution.

B) Module Characteristics and Features:

1. Open architecture API making possible to integrate many sensors, devices and services;
2. User can select and contact field agent(s) close to the emergency site to solve it;
3. Mobile interface for field agents to interact with the platform, accessing information about emergency case and communicating to control center
4. A communication group can be built between the controlling user and field agent(s) for fast communication and assistance in the case attendance;
5. Field agents can be invited, added or removed in an attendance group, even it already created;
6. Access via mobile app to quick buttons and icons used by field agent to update status, such as: "Received", "dispatched to the place", "arrived at the place", "in processing", and others;
7. The mobile app should provide real time the GPS coordinates to control center related to the place where the field agent is going to;
8. The GPS coordinates are tracked and showed in maps for the controlling user;
9. The field agent can feed the controller with feedback and processing status related to the procedure and resolution of the emergency case;
10. If more than two field agents are going to be assigned to the emergency case, from the mobile terminal, all of them should receive information relate each other and case resolution;
11. Attendance groups can be closed after case resolution;
12. The mobile app should be able to be a communication way (by text, call, video calls and files sharing) between the assigned field agents and the controlling user;
13. The agent's communication is automatically recorded and kept in the platform;
14. The platform can build a quick flow chart presenting the agents and users involved in the case;
15. In the mobile app the field agent can report SOS emergency just with a single click in a specific bottom;

16. Searches related to the case feedbacks can be quickly made in the platform;
17. The field agent can upload snapshots and videos in the platform through mobile app to help in the resolution. The controlling user can manage the files;
18. On feedback report, the field agent must be able to record the site position, the category of event and resolution protocol applied to the case, filling in the blanks on a template through the mobile interface.
19. Live view video streams should be opened from the mobile terminals, and automatically shown in the platform dashboard, for quick assistance on case resolution;
20. The live view videos can be recorded in the edge devices (like mobile recorders) making possible the access to files in further moment;
21. Facial and vehicle plate pictures taken in the field from mobile terminals, will be automatically reviewed by blacklist on control center, alarming positive confirmations to the user controller, reporting the position where the picture was took;
22. The facial and vehicle plate pictures keep available in the platform for further searches;
23. Slashing flags must represent to the controlling user the emergency case at the right position on a map.
24. By clicking on the flashing flags, the controlling user can see status, alarms and get more information of the emergency case;
25. Dashboard reports, including charts and statistics, can be obtained from platform to control the user activities;
26. The controlling user can request a pie chart, filtering events by characteristics, such as: effective receiving quantity, type of event (traffic, public safety, robberies, theft, criminal process, so on), cases received and cases processed;
27. The pie chart can represent the emergency cases periodically (weekly, monthly, yearly);
28. Field agent positions can be shown in real time to the controlling user, sorting out them by agency, jurisdiction area, patrol area and precinct;
29. Controlling user must be able to know by the flashing flags the time spent, operator assigned, receptor and many information related to the case;
30. By clicking on the map and creating a square/circle, the controlling user must be able to see what are the closest field agents available in the specified area;
31. Once the field agents are selected to attend a case, a communication group is created, enabling them the communication between each other through the platform;
32. The platform creates a feedback process to the controlling user, showing key information regarding the case, such as: level, type and status. In each status change, a short description related to the change is presented in the platform, as well as the update time;
33. Controlling users are able to add a case manually on the map, uploading a responsible person for attendance, time, location, phone number, category, descriptions and remarks;
34. After case confirmation on system, the emergency appears in the map as an icon (flag or balloon);
35. Controlling users can manually define in the map where the emergency is happening;
36. Emergencies can be denied or canceled when necessary. The operation will be kept in the system, including details such as: operation, time, date and cancel/denied reason;
37. Details received from different sources, do not directly connected in the platform (phone calls for example), can be added in the case by the controlling user;

38. Emergencies cases are represented in the system by icons. Depending on the urgency priority, the icons can be distinguished;

## 2.4 AUDIT, HEALTH & MANAGEMENT MODULE

A) This module is designed to bring intelligent functions to manage the system, control smartly their hardware and software performance, work despite the system architecture, even federation or cluster design. From this module the controlling user has access rights to make auditioning, applying and following up the policies defined to the organization. This module also check the functionality of the devices connected to the platform (cameras, servers, edge devices, etc) according to the “keep-alive” plan defined to it.

B) Module Characteristics and Features:

1. Module Collects and records information from surveillance cameras;
2. The data collected and recorded from the module can be applied to the surveillance system for several management intentions, including general planning and daily management;
3. Via dashboard the controlling user can see details from facial and vehicle devices alarms;
4. The quantity of alarms should be shown filtered by source (facial, vehicle and others) in the dashboard;
5. For audit purposes, statistics related to the cross-search vehicles (including key details such as: brand and model) can be obtained from and displayed in the dashboard;
6. Audit actions can also have the total number of identified people, including the facial triggers, total amount of facial alarms, captured facial pictures, total facial pictures compared against the database, as well as the similarity percentage, displayed in the dashboard;
7. The controlling user can select to be displayed in the dashboard statistics related to the facial snapshots, tracking the places where the snapshots were mostly taken. The system can report the face pictures captured by week or other periods;
8. System checks details in real time related to vehicles;
9. System accesses and manages the facial and vehicle triggers and show results in the dashboard;
10. System manages facial and vehicle alarms, as well the triggers which activate it. The controlling user can request the statistical data to be shown in the dashboard
11. Easily gets information and details of a interested vehicle or face, as well triggers it;
12. The module makes daily scans in the full system to check if all devices connected are working properly. The scanning plan includes cameras, edge devices, servers and others;
13. Reports preseting the numbers of actived/inoperanted devices can be got. The system presents the results (% rates);
14. The system should keep results related to alarms and events in log files;
15. Log files must be available to be accessed by filtering searches. The results should to be exported for auditing or troubleshooting purposes;
16. The log files size should to be controlled and defined by the controlling user;
17. The system can share information related to the management, logs, alarms and report to external / third-party / external platforms. The sharing can be deployed through key protocols such as: SNMP, e-mail, message, FTP, etc;

18. All partitions and devices which compose the system's modules are checked by the module through a service synchronism which allows their management;
19. Addition, modification and exclusion of any device should be managed by the module.
20. Devices included in the module scan can have their video quality statistics presented in the reports. If the results are not achieving the pre-settled rates, the system can alarm the controlling user;
21. This module can easily and fast find the devices in through the tree menu;
22. Controlling users can manage one or various devices simultaneously from the tree menu. They will be able to verify detections, video quality and device analytics;
23. As soon as the controlling user receives a report from the system, a plan can be created to solve the low results reported;
24. A quality check plan can have its functional period defined by the controller user. When programming time comes, the quality plan routine is automatically executed in the system;
25. Can be part of check plan:
  - A) Device diagnostic;
  - B) Video sources;
  - C) Scheme name, type, including their enabling/disabling and time to execute;
  - D) Time slot to check the "keep-alive" to the devices, establishing routines for checking by seconds;
  - E) Time to begin the cycle and estimated time to finish;
  - F) Detection cycle;
  - G) Diagnostic plan and descriptions;
26. Alarms from connected devices turned off-line are sent by the module;  
The alarm report results can be managed by the controlling user, which can also include possible fails captured by video diagnostic;
27. The system centralizes the diagnose plans and schemes, granting manageability to intended users;
28. The module is able to get health parameters from the connected devices, such as: servers, storage, edge devices, cameras, etc;
29. All reports and results can be shown in the system interface dashboard, including web access;
30. Each detection and video plan can be periodically executed by the system. The control user can define when the plan will be applied, as well as their frequency (yearly, monthly, daily or even instantaneously when manually selected);
31. Plan's cycles which couldn't be finish in for any reason must be restarted in the next day from stoppage;

## 2.5 SMART SENSORING AND AUTOMATION MODULE

A) This module enables in the system the possibility to integrate, command and manage many different signals from different edge sensors and devices, such as:

- A) ERP Organizational Systems;
- B) IOT, SCADA, BMS and controllers;
- C) Cameras, Radars, LPR and drones;

- D) Access Control, Perimeter, Intrusion and Fire Systems;
- E) Video Analytics, metadata (human and vehicle) and Face Recognition;
- F) Network and Cyber environments;
- G) Radio, intercom and IP communication in general;

B) Module Characteristics and Features:

1. Able Works like a PSIM – Physical Security Information Management;
2. Uses the Cyber security concept to manage and control the sensors and signals;
3. Is a processing center that fuses the integration between other systems, building a strong dashboard interface, centering the actions and management in a single screen;
4. Acts like a GSOC – Global Security Operations Center;
5. Embeds SIEM – Security Information Event Management;
6. Push notifications are used to the mass alarms and alerts;
7. Establishes tours and patrols from RFID sensors and tags;
8. Able to act like a BI – Business Intelligence System, sharing aconditionated data to company business;
9. Works freely with hierarchical and distributed system architecture, clustered or federated, keeping the police statements despite of the running system;
10. Collects automatically signals from the systems and field sensors;
11. Can give rights to define priority between the signals and incidents;
12. Provides quick response and resolution from the same dashboard where the events appear
13. Applies automation and management protocols through Ethernet TCP/IP, such as: BACnet, Modbus and SNMP;
14. Can be able to customize screen for signals management from BACnet & Modbus sensors, being able control a lof of devices through these protocols, such as:

- A) Water Pumps;
- B) HVAC systems (Chillers, air handlers, etc);
- C) Compressors;
- D) Elevators;
- E) Hydraulic devices in general;
- F) Gas detection;
- G) Central Plant;
- H) Fan Coil Units;
- I) Lightning;
- J) Exhausting Air systems;
- K) Fire, smoke and heat sensors;
- L) USCA interface from power generators;

15. Gives to the controlling user menus and buttons to Interact (open, close and troubleshoot) the sensor from the management screen,
16. Presents visual charts and block diagrams to represent the connections and interactions flow;
17. Creates many alarms and alerts from about sensor behavior, sending the alarms via SMS, e-mail, SNMP traps or displaying in the web system interface;
18. Able to scan the sensors and units checking parameters and proper functionality;

19. Gives to controlling users access, management rights and alerts related to the system working conditions, following the hierarchical and user access policies on mobile app,
20. Generates several reports, presenting line and pie charts related to the performance of Bacnet & modbus devices and sensors. Reports should to exported in PDF, CSV, XLS or DOC;
21. Allows creation of hosting schedules specifying sensors and devices, alerting related maintenance, routines, resets, tests and etc
22. Presents a friendly management dashboard, reporting with virtual audiovisual controller the key system status;
23. Able to work with Electrical and power systems, presenting the main electrical magnitudes, such as: tension, current, power factor, harmonics, real power (in watts), aparent power (in VA), reactive power (in VAR), demand, etc;
24. Capacity to Interact to HVAC system, making startups, powering on, powering off and controlling this equipment;

### **PART 3. STORAGE TOPOLOGY**

A) The STMS system provides and handles a massive data and information volume. Due to that, the databases and storage must be cost-efficient, able to handle long-term partitioning and allowing to be executed in flexible architecture.

B) Despite of the storage topology, the database volume will always be single to the application. The data processing is responsible to re-index the files according to the distributed storage plan and files labeling, remounting the data in any volume wherever the information is.

C) The storage scheme can be deployed through the following resources:

1. SAN – Storage Area Network – Through FCoE architecture and fiber channel devices, the system can perform in milliseconds the massive data queries;
2. SAS & DAS - For medium-large scenarios, serial attached storage and/or Direct Attached Storage can properly attend the expected performance and data protection, saving resources and costs;
3. NAS – Network Attached Server are strictly intended for small-medium design, requesting more network resources, like 10gigabit / gigabit Ethernet switches, more complex network environments and administration, however saving costs.
4. Specific hard disks chosen according the queries flow. It works with IDE, SATA and SCSI disks, and their variations. Mechanical and solid state disks are also properly able to running in the system. SD Cards are also applied in edge devices;
5. ANR – Automatic Network Replenishment – if the network connection fails, keep recording in the edge, and have automatically the data rebuilt in the database, when the network come back;
6. Several resolution and scheduling plans can be defined in the system, resulting in numerous possibilities to storage consumption. Freely apply audio and video codec's compression to decrease the packets load (H.264. H.264+, H.265, H.265+, MJPEG. G.711, G.724 and many others);

7. Different frame and bit rates for each video recording can be established into the system;
8. The time slot to retain database the information can be defined. Recycle plans can be developed, newest files can overlap the oldest;
9. Own and universal formats can be defined to record the files. Some of them can be lighter than others;
10. using correct edge devices, records video from analog devices on the same partitions as IP devices