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Overview

SentiVeillance Server is a ready-to-use solution which adds face recognition and advanced video analytics to Video Management Systems, such as the ability to quickly and accurately recognize faces in video streams and trigger analytical event notifications whenever an authorized, unauthorized or unknown person is detected. This greatly improves the workflow of VMS operators, allowing them to quickly react to changing situations and to easily view video of past events and filter them by gender, age or person ID.

SentiVeillance Server supports most popular video management systems: Milestone XProtect VMS and Luxriot Evo, Evo S and Evo Global. SentiVeillance Server can process up to 10 video streams from multiple video management systems, all in real time.

SentiVeillance Server includes Neurotechnology’s latest deep neural-network-based facial detection and recognition algorithm which significantly improves identification accuracy and speed. The algorithm is based on more than 13 years of development and research and has been tested in the NIST Face Recognition Vendor Test (FRVT) Ongoing.

Installation

Please check that machine meets technical requirements:

- CPU: Recommended Intel i7-7700K or better.
- GPU: NVIDIA GeForce GTX 1080 or better.

SentiVeillance Server is distributed as Docker containers. Below we provide information about recommended versions of operating system and drivers which have been tested to work well. It may be possible to choose other versions, but in particular using different versions of NVIDIA graphic card drivers are known not to work.

Installation steps:

1. Install Debian linux distribution `debian-9.7.0-1-amd64-with-docker.iso` with Docker.

2. Install NVidia GPU driver.

   1. $ sudo ./NVIDIA-Linux-x86_64-430.26.run
      
      Choose Yes to disable Nouveau driver during NVidia GPU driver installation, reboot OS and run NVidia GPU driver installation again. Select default choices during installation.

   2. $ sudo ./NVIDIA-Linux-x86_64-430.26.run
      
      Check installed NVidia driver.

3. $ nvidia-smi
3. Install the SentiVeillance Server. Run the installation wizard and follow instructions on screen:
   $ sudo ./sentiveillance-server-ctl.sh install
   • Choose to use default ip address.
5. Once installed and configured, start the SentiVeillance Server:
   $ sudo ./sentiveillance-server-ctl.sh start

Updating

1. Check NVidia GPU driver version.
   1. $ nvidia-smi
   2. Version should be 418.39 or greater.
   3. Download newer driver from NVidia web page.
   4. Stop surveillance server:
      $ sudo ./sentiveillance-server-ctl.sh stop
   5. Install downloaded driver:
      $ sudo ./NVIDIA-Linux-x86_64-DRIVER.VERSION.run

2. Run update command:
   $ sudo ./sentiveillance-server-ctl.sh update

3. Start server:
   $ sudo ./sentiveillance-server-ctl.sh start

Updating from 7.0 to 7.1

Due to changes to licensing service, update from 7.0 to 7.1 require a few extra steps.

1. Check NVidia GPU driver version.
   1. $ nvidia-smi
   2. Version should be 418.39 or greater.
   3. Download newer driver from NVidia web page.
   4. Stop surveillance server:
5. Install downloaded driver:
   $ sudo ./NVIDIA-Linux-x86_64-DRIVER.VERSION.run

2. Navigate to 7.0 Activation folder and stop licensing process.
   $ sudo ./run_pgd.sh stop

3. Navigate to 7.1 Activation folder and register the licensing service.
   $ sudo ./startup_npgadmin.sh register

4. Run update command:
   $ sudo ./sentiveillance-server-ctl.sh update

5. Start server:
   $ sudo ./sentiveillance-server-ctl.sh start

**Uninstalling**

Purge command can be useful if there is a need to completely remove SentiVeillance Server components and all data created by the system (including whitelists and blacklists).

It is also needed for partial or uncompleted installations which have to be cleaned up, so that the new installation could start from clean state.

The following command should be used to purge all components and data:

   $ sudo ./sentiveillance-server-ctl.sh purge
Basic licensing service configuration

1. Start the server.
   
   ```
   $ sudo ./sentiveillance-server-ctl.sh start
   ```

2. Open Web Control Panel in internet browser (see below) and navigate to Licensing category (1).

3. Choose desired licensing configuration (Trial, Internet, or Dongle) from dropdown menu (2).
   
   a. If you selected Dongle, plug in a dongle with Neurotechnology licenses.
   b. If you selected Internet, click Add License button (3) to upload an internet license.

4. Restart SentiVeillance Server.
   
   ```
   $ sudo ./sentiveillance-server-ctl.sh restart
   ```

5. Open Web Config again. If the service has started correctly, you should be able to see license usage in License Usage Log tab (4).
License usage log of correctly configured Dongle.

License Usage Log when the licenses cannot be obtained.

Example of correctly working License Info tab with Trial configuration.
Advanced configuration and troubleshooting

- If you need to replace a dongle, first change it physically, then restart the SentiVeillance server so it obtains licenses correctly.
  1. Replace the dongle physically.
  2. Restart the SentiVeillance server with `./sentivellance-server-ctl.sh restart` command.

- If the Licensing category shows “Licensing service is unavailable.” message, it might mean that the licensing service has not started automatically. You might need to start it by hand.
  1. To do so, navigate to `/opt/neurotec/sentiveillance-server-unit/actvation` folder.
  2. Run `./startup_npgadmin.sh register`
  3. Run `systemctl start npgadmin`
  4. Return to the Web Config, check if the licensing service is running correctly and configure it if needed.

- Sometimes you might need to configure licensing service by hand, especially if using older versions of SentiVeillance Server.
  1. Navigate to `/opt/neurotec/sentiveillance-server-unit/actvation` folder.
  2. Edit `pgd.conf` file to configure the service.
     a. To use licenses from a dongle leave only one uncommented “mode = server” line in `pgd.conf`.
  3. Run `./run_pgd.sh start` to start the licensing service.
  4. You can check if the Neurotechnology licensing service is running correctly with `./run_pgd.sh log` command.

- There is a known issue on some computers where Licenses Info displays “Detected Dongles: none” despite correct dongle(s) being plugged in. This doesn't affect the licensing, check License Usage Log to see if SentiVeillance Server correctly obtains licenses (see above).
Web Control Panel

SentiVeillance Server can be configured using user friendly Control Panel. It can be accessed using Web Browser by navigating to the IP address of the machine where the SentiVeillance Server is installed. Default Control Panel user “Admin” and password “Admin”.

VMS connection management

To use SentiVeillance Server functionality in VMS (Video Management Software) you need to register Milestone, Luxriot VMS or Generic Client in SentiVeillance Server. After registration VMS will get events about identified suspects from black and white lists.
Register VMS server

Choose to register one VMS (Milestone, Luxriot or Generic Client) and fill required information. At the end of the form select the raised events for emerging in VMS.
Recognition grace period – Determines when events are raised. Greater value increases event accuracy but also delays event. Event is raised after subject was tracked for specified amount of time or if disappeared earlier. This parameter is only for:

- Blacklist Suspect Found
- Whitelist Suspect Found
- Unknown Suspect Found

Start all automatically – Determines if all existing or newly added sources will be started for processing automatically. If not checked, user will need to manually select which sources will be started. If changed to checked after registration, only new sources will be started automatically.

Raised events – Determines what events to raise. Found events are raised during tracking and disappeared events are raised only when suspect disappears.

- **Blacklist Suspect Found/Disappeared** – event raised when suspect from blacklist found/disappeared.
- **Whitelist Suspect Found/Disappeared** – event raised when suspect from whitelist found/disappeared.
- **Unknown Suspect Found/Disappeared** – event raised when suspect not belonging to any watch list found/disappeared.
- **ObjectFound/Lost** – event is raised when vehicle, human or license plate is found/lost.
- **Objects Track** – combines vehicle or human events into one event.
Start VMS driver

Start VMS driver after registration. VMS driver will automatically connect to the VMS and receive video streams and other data required for analytics and will send back events to VMS.
Watch list management

Enrolling subjects to watch list

In order to find desirable or unwanted persons it is needed to fill watch list. Add person's information from picture or from template (NTemplate).
Viewing watch list entries

It is possible to view enrolled persons by double clicking on list item.
Configuration

It is possible to configure SentiVeillance Server in Control Panel’s Properties section:

![Configuration Settings](image)

**Matching threshold** - the minimum score that functions accept to assume that the compared face belong to the same person. The higher the threshold value, the more similar feature collections will have to be to yield positive result during matching.

**Faces template size** - size of face image templates when tracking subjects or enrolling from image file. Can be used Small, Medium or Large template. It is recommended to use large template size. This parameter is used when generating a template from tracked subject. The large template is most accurate but slowest.
Faces minimal inter ocular distance – the bigger value is the bigger face or face closer to camera for detection.

Vehicle-Human detector scaling - the biggest value (Three) is the most accurate detection, but the slowest vehicle or human detection.

Vehicle-Human detector threshold – the minimum score that detector accept to assume that the object is vehicle/human. If vehicle/human confidence is lower than threshold the object is not detected.

License plate detector scaling - the biggest value (Three) is the most accurate detection, but the slowest license plate detection.

License plate detector threshold – the minimum score that detector accept to assume that the object is license plate. If license plate confidence is lower than threshold the object is not detected.

License plate OCR threshold – OCR threshold.

Interpret license plate 0 as zero.

Using with Milestone XProtect VMS

Connecting SentiVeillance Server and Milestone XProtect VMS

The following steps need to be performed in order to connect SentiVeillance Server and Milestone XProtect VMS. After the configuration the two products communicate automatically.

1. Register VMS server (in SentiVeillance Server Control Panel)
2. Start VMS driver (in SentiVeillance Server Control Panel)
3. Configure Milestone XProtect VMS to record video (recommended). This allows to rewind video to position where events happened.
4. Add analytics events and alarms definitions (in Milestone XProtect VMS Management Client)
5. Enable analytics events.
Add analytics events and alarms definitions

Navigate to Rules and Events->Analytics Events in Milestone XProtect Management Client and enter Name of analytic events you will be receiving:

- BlacklistSuspectFound
- BlacklistSuspectDisappeared
- WhitelistSuspectFound
- WhitelistSuspectDisappeared
- UnknownSuspectFound
- UnknownSuspectDisappeared
- ObjectFound
- ObjectLost
- ObjectTrack
Additionally alarms can be configured to be shown in XProtect Smart Client application (Not available with XProtect Essential+).

Navigate to Alarms->Alarm Definitions in Milestone XProtect Management Console. Create new alarm definition, enter name Alarm definition->Name, choose Trigger->Triggering event->Analytics Events, choose analytic event and select cameras from Sources.
Enable analytics events

Navigate to *Menu->Tools->Options...->Analytics Events* in Milestone XProtect Management Client and add tick in *Analytics Events Enabled*. 

![Options window](image)
In group of Security choose *Events allowed from:*->*All network addresses* or specify network address of SentiVeillance Server.

![Options](image)

### Viewing analytic events in VMS

The following actions need to be performed before analytic event can appear in the VMS:

1. Connecting SentiVeillance Server and Milestone XProtect VMS
2. Enrolling subjects to watch list

### Plugins

In order to use full functionality of SentiVeillance special Neurotechnology plugins have to be installed on the Milestone machine.

To enable it, perform the following steps:
1. Copy plug-ins `\Bin\dotNET\MilestonePlugins` directory to Milestone plugin directory “C:\Program Files\Milestone\XProtect Smart Client\MIPPlugins”
   
   1. CustomLayoutPlugin
   2. EnrollmentPlugin
   3. SearchPlugin
   4. SettingsPlugin
   5. VehiclesAndHumansPlugin
   6. WatchlistPlugin

2. Launch XProtect Smart Client
3. Navigate to settings in right top corner.
4. Enter SentiVeillance Server IP, VMS name and server credentials: User name and Password.
**Custom Layout**

You can create custom layout by adding columns and rows to an existing layouts. Choose „Create Layout“. Select existing layout from listed values and enter width / height for new column / row, click on „Add Column“ or „Add Row“, fill the name and save the new layout.
Here you can find your created layout.
You can add use created layout “NewLayout” and drag and drop one Neurotechnology plugins:
Vehicles and humans plugin added to the right into created column

Event Search

To be able to search through events, open Search tab. There you will be able to search for events (Faces, Humans, Vehicles, Humans, License Plates) coming from SentiVeillance Server.
Events with license plates.
Watchlist

To be able to see identified suspects from the black and whitewatch list in real time, add the Watchlist plugin into the layout. It will show detected faces and the matching entries from the watchlist.
**Enrolling into Watchlist from events**

In addition to enrolling subjects into Watchlist through Web Config, it is also possible to enroll a subject detected by SentiVeillance directly through Milestone VMS plugins.

1. Open Playback tab and find the shot containing the subject that you want to enroll. For best results it is preferable that the face be visible as clearly as possible.
2. Click Enroll button in the upper right corner. This will open Enrollment window.
3. Draw a rectangle over the subject’s face to select the area and enter an ID that the subject will be enrolled under. Note, that if face is poorly visible, you may need to check “Accept low quality image” box, but use this possibility very rarely. Finally, click Enroll.
4. The subject will now appear in Web Config in the Watchlist tab. You can click on the subject to see their details.
**Vehicles and Humans**

To be able to see vehicles and humans that appear in the video stream, add the Vehicles and Humans plugin into the layout. Now you will be able to see vehicles and humans appearing in the video stream and filter through results, with such options as object type (person, car, van, bicycle, etc), color, and direction of movement.

Filter interface.
Human detection.

Vehicle detection.
Using with Luxriot EVO VMS

Connecting SentiVeillance Server and Luxriot EVO VMS

The following steps need to be performed in order to connect SentiVeillance Server and Luxriot EVO VMS. After the configuration the two products communicate automatically.

1. Register VMS server (in SentiVeillance Server Control Panel)
2. Start VMS driver (in SentiVeillance Server Control Panel)
3. Configure Luxriot EVO VMS to record video (recommended). This allows to rewind video to position where events happened.
4. Configure external service group (in Luxriot EVO VMS Management Console)

Configure external service group

Navigate to Configuration → External services in Luxriot EVO Management Console. If Register VMS server and Start VMS driver steps were performed successfully, an entry named

- Neurotechnology SentiVeillance Server Faces
- Neurotechnology SentiVeillance Server Vehicles, Humans and ALPR

should appear in the list.
Add a new external service group using *New external service group*. In this example we choose a names “NFaces” and “NObjects“.
Double click on “Neurotechnology SentiVeillance Server Faces” to open a group assignment form. Choose the group created in the previous step (“NFaces” in our example) and click OK to confirm.
Finally, the result should be similar to what is show in screenshot below:
Now the SentiVeillance Server and Luxriot EVO VMS are connected. In Luxriot EVO Monitor you can see added SentiVeillanceGroups “NFaces“ and „NObjects“

See image below.
**Viewing analytic events in VMS**

The following actions need to be performed before analytic events can appear in the VMS:

1. Connecting SentiVeillance Server and Luxriot EVO VMS

2. Enrolling subjects to watch list

Enrolled subjects to watch list are identified by SentiVeillance Server, an events are sent to Luxriot EVO VMS. Data appears in user interface in the list on the right (see screenshots). On right bottom “Notification Panel” click on the bell icon and you can see fired events.
When clicked on the specific event in the list, Luxriot EVO VMS will rewind video at the time when
the event happened so that operator could examine manually if the actual person has appeared.
Search by attribute

SentiVeillance Server allows to search through generated analytic events to find the ones which meet specified criteria, such as:

- Suspect id
- Status
- Age
- Gender. If gender is not determined, the suspect is assigned to both genders.
- Time interval

Navigate to SentiVeillanceGroup in Luxriot EVO Monitor and select Channels->NFaces/NObjects to enable search. Select cameras on the left. Enter the requires search criteria and click Search. The results are displayed in the list below. One of the events may be clicked and VMS will show video at the moment where event happened.
Using with Generic VMS Client

Connecting SentiVeillance Server and Generic VMS Client

The following steps need to be performed in order to connect SentiVeillance Server and Generic VMS Client.

1. Register VMS server using Generic VMS Client (menu → Change Configuration → SentiVeillance Server → Register). See below.
2. Start VMS driver (in SentiVeillance Server Web Control Panel if not started)
3. Connect cameras and start using Generic VMS Client with SentiVeillance Server

Register VMS server using Generic VMS Client

Start GenericVmsClientSampleCS.exe from SentiVeillance_7_1_Server_2019-05-08.zip/SentiVeillance_7_1_Server\Bin\Win64_x64\
Choose Change configuration, Click on Event Listener question mark and grant permissions

Execute copied command with administrator.

```
C:\Windows\system32>netsh http add urlacl url=http://*:8081/ user=Everyone
URL reservation successfully added
```
Fill SentiVeillance Server address, user and password.
Register VMS in SentiVeillance Server using Generic VMS Client. Enter SentiVeillance Server IP address and choose other options.
Check in SentiVeillance Server if registered VMS is running.
Add cameras and start using Generic VMS Client with SentiVeillance Server.

Added camera.
You can change setting from menu Change Configuration and parameter on right side of Generic VMS Client. You can switch between Live or Search or fill Watchlist in right top corner.
API
SentiVeillance Server can be programmed using RESTful API. It exposes the same functionality as available in Web Control Panel.

Typical scenarios include maintaining white and black lists of subjects. Subjects can be enrolled either from images, or from existing templates created using VeriLook or MegaMatcher SDK 11.0 or later.

Programming language support
SentiVeillance Server API package provides ready to use libraries for .NET and Java. Other language client libraries can be generated from provided Swagger specifications.

.NET
.NET client library Neurotec.SentiVeillance.Server.Rest.dll can be found in Bin/dotNET directory. The library should be added as Reference to .NET project.

Java
Java client library neurotec-sentiveillance-server-rest.jar can be found in Bin/Java directory.

Other language support
SentiVeillance Server API is specified using Swagger (see http://swagger.io/) which allows to generate client libraries for most popular programming languages. Swagger provides all the necessary tools, for example Swagger Online Editor makes it extremely easy to load Swagger specification and generate client library for chosen library using simple user interface: http://editor.swagger.io/#/.

Authentication
SentiVeillance Server uses Basic HTTP authentication.

API Reference
Complete SentiVeillance Server API reference is provided in Documentation/sentiveillance-server-rest.html.

Additional information
If you need additional information how to install, operate, program, or anything else related with the SentiVeillance Server, don’t hesitate to contact Neurotechnology support team who will be happy to help: support@neurotechnology.com.