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THE SGSE FORENSIC LPR FOR SMART CITIES

The context

The rapid development of artificial intelligence in the electronic security market has facilitated access to a greater volume of information on the scene thanks to the classification of objects of interest (mainly vehicles and people).

The technological evolution of license plate recognition cameras has also allowed greater precision in the capture of license plates at speed, which until recently, was unimaginable at a reasonable cost.

This has provided access to a new era in smart cities, thanks to these devices that allowed operators with much more information to gain in depth knowledge of the real-time behaviour of their municipality, as well as the possibility of solving complex situations through recorded video.

The SGSE Forensic LPR at Milestone

SGSE has developed an integration in Milestone to carry out forensic analysis on the recorded video with the information from the artificial intelligence of each certified license plate recognition camera in this integration.

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FORENSIC LPR

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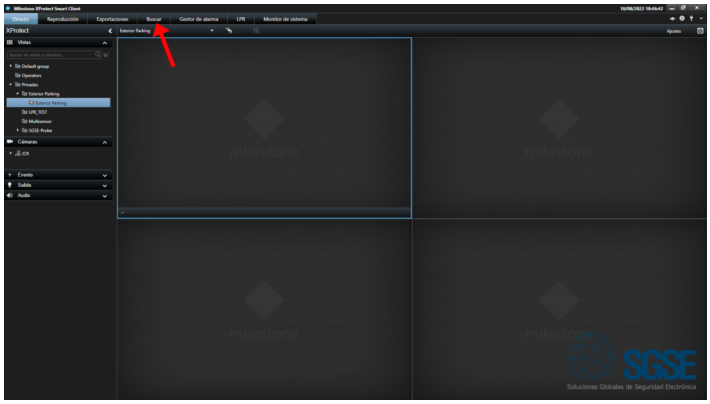
With the Forensic LPR, in any of the software editions of Milestone, we can:

- Search the recorded video by full or partial license plate.
- Search the recorded video by LPR camera characteristics integrated into the Forensic LPR.
- Create blacklists and whitelists.
- Create PDF reports.
- Create CSV reports.

The available characteristics are based on each camera, the most common being:

- License plate.
- Type of vehicle.
- Colour of vehicle.
- Type of registration.
- Vehicle make.
- Country of registration.

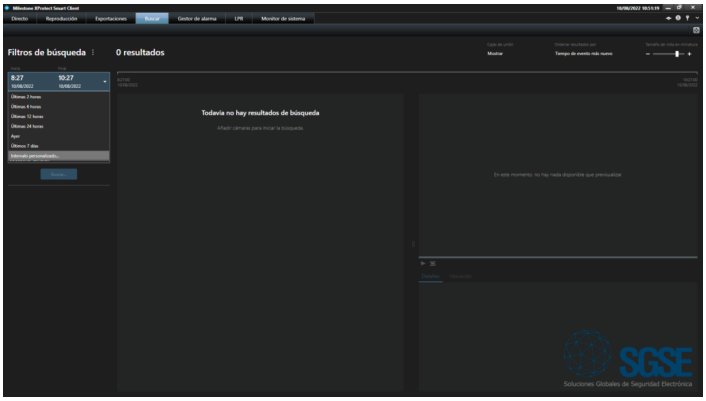
When the operator needs to open an investigation into an event, they can find all the search tools in the **Search** tab of Milestone Smart Client shown in the image below to work more efficiently in a single place.



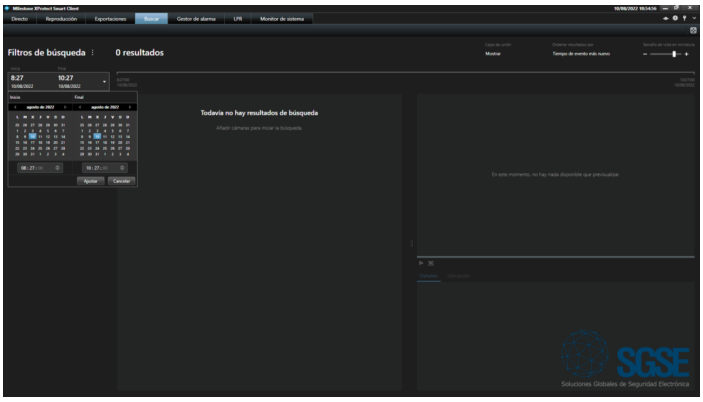
Within the Search tab, the operator can search by:

- Movement.
- Alarms.
- Events.
- Markers.
- Metadata.

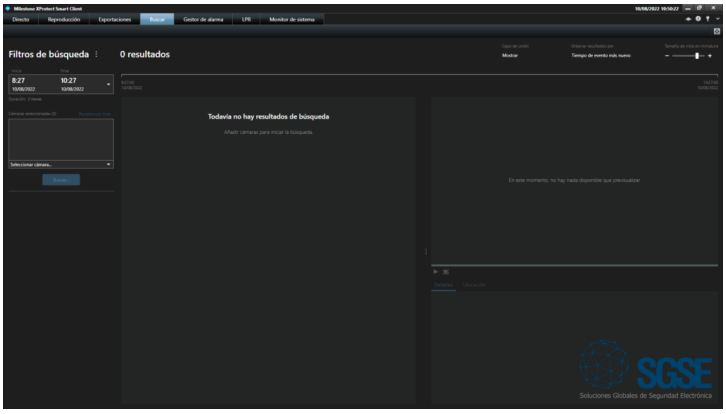
To start a search, we must select a time window within the different predefined options that appear in the drop-down menu shown in the following image:



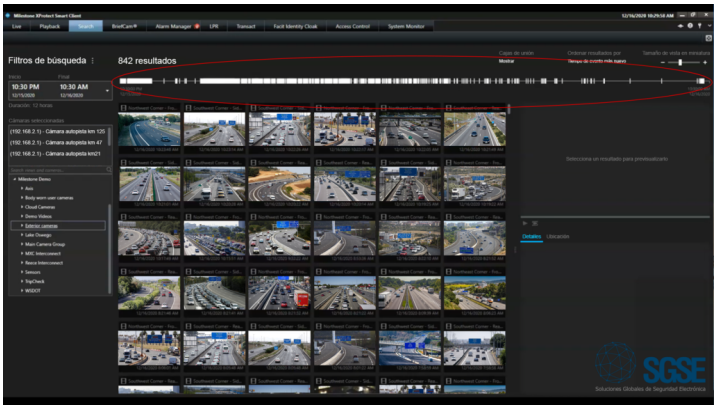
Or customize the search through the calendar:



Subsequently, we select the camera or group of cameras on which we want to perform the search:

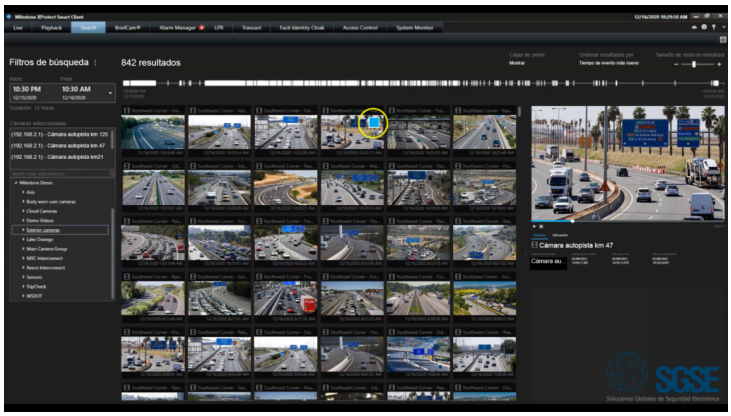


Once the search on the camera or the set of cameras has been executed, we have the total number of results (in our example below, a total of 842) distributed in the time window that we have defined over which the operator can move easily.

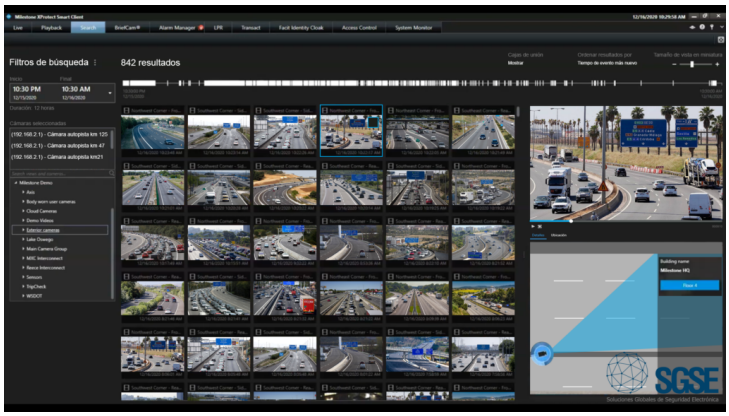


By clicking on any of the video thumbnails obtained from the search, a blue square will appear, indicating that we have opened an investigation on this thumbnail through its recorded video sequence in the right margin of Smart Client.

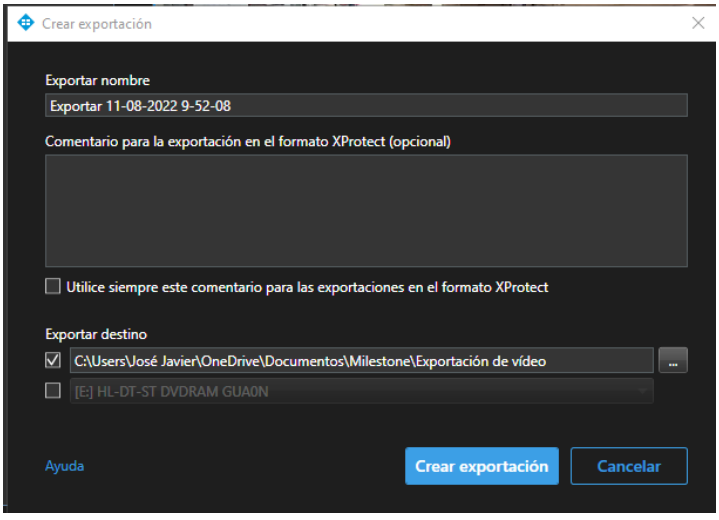
In our case, we see it in the video segment recorded from camera KM47 for the moments before and after the search timeline to access all the details.



This way we access all the details, as well as having the location of the camera.



We can finish the investigation by exporting the recorded video sequence as shown in the image below:



Filters for intelligent searches on video recorded with the Forensic LPR

Thanks to the Forensic LPR developed by SGSE we can find a significant number of additional filters for intelligent searches.

This allows us to provide the operator with a powerful forensic tool to solve incidents in our municipalities.

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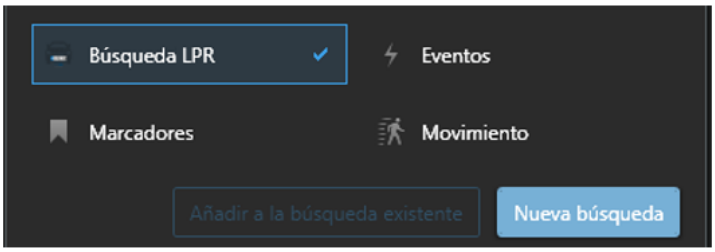
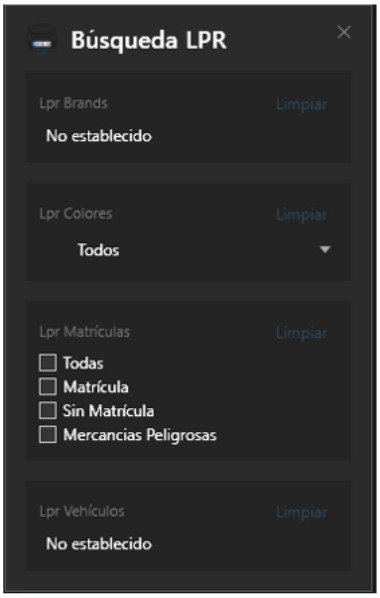
XProtect Professional+
XProtect Expert
XProtect Corporate

Within the Search tab, previously explained, we will have different options to run the search in the recorded video, among which is the **LPR Search** module which gives access to the filters of the different characteristics provided by this LPR camera model.



Once we click on Search LPR, we see the different search filters such as the **License Plate Type** shown below:



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We can filter according to the type of license plate and have the option of searching for those vehicles that do not have license plates within the LPR camera's field of view as well as vehicles that transport dangerous goods.

The following set of images details these different types of vehicles, which can be filtered based on their license plate type.

LICENSE PLATE

WITHOUT LICENSE PLATE

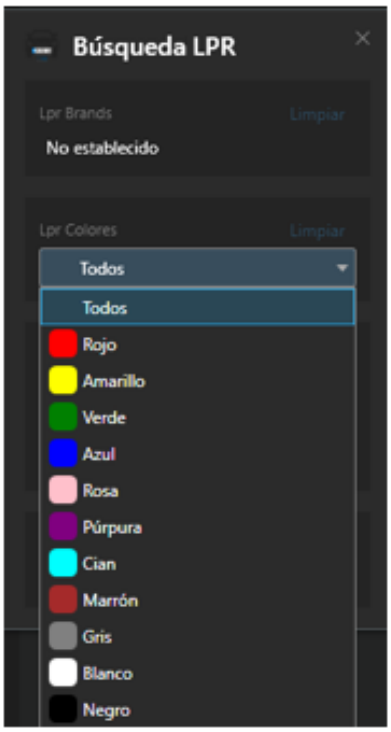
DANGEROUS GOODS

We can continue in the filter options with the **Vehicle Make** within the LPR camera's field of view, as detailed below.

A total of 86 vehicle makes are available, shown in the table below.

Hyundai	SsangYong	Alfa Romeo
Toyota	Citroen	Great Wall
KIA	Fiat	Infiniti
Volkswagen	Scania	Smart
Benz	MAN	Maxus
Nissan	Volvo	JAC
Ford	Lexus	Jaguar
Isuzu	Seat	GMC
BMW	Land Rover	Lincoln
Chevrolet	Daihatsu	JMC
Mitsubishi	Dongwo	SAAB
Renault	Subaru	FAW
Opel	Iveco	Yutong
Suzuki	MINI	Guangzhou Yunbao
Skoda	JEEP	Joylong
Daewoo	Porsche	Geely
Audi	Chery	Cadillac
Mazda	Dodge	JBC
GAC HINO	Chrysler	An´Kai
Peugeot	Acura	Haima
Foton	King Long	Dongfeng
Geely-Emgrand	Perodua	UD
BYD	Renault Samsung	Proton
HICOM	Hyundai-Rohens	SsangYong-Old Version
Equus-Old Version	CNHTC	Rolls-Royce
Beiben Truck	Haval	Hino
Kia-Borrego	Chang´an	Alfa

Apart from the make of the vehicle, we can also carry out a search by its **Colour**, a total of 11 colours being available in an additional filter.



This set of filters can also work in combination with the **Vehicle Type** for forensic analysis of the recorded video.

- Car
- Pickup
- Van
- Bus
- Truck
- Small truck
- Scooter
- Motorcycle
- SUV
- Pedestrian

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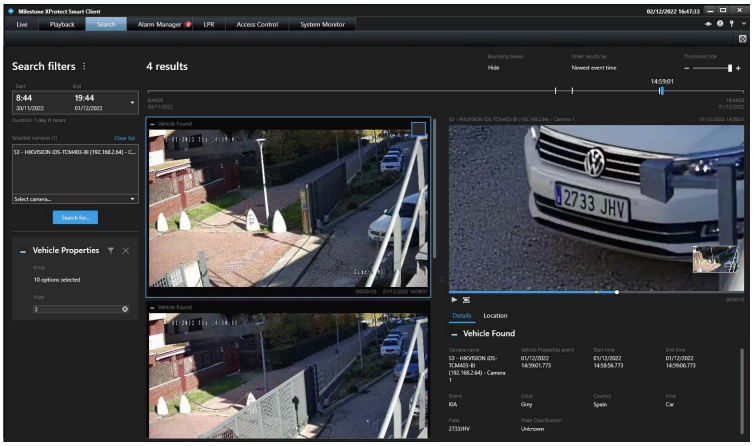
Thus, the development of SGSE allows us to carry out a precise forensic analysis of the recorded video of our facility in order to resolve incidents quickly and effectively.

Searches for partial license plates in the Forensic LPR

To facilitate the operator's tasks and be able to solve complicated situations in which we do not have all the information, the Forensic LPR allows searches with partial information of the desired license plates based on a set of incomplete alphanumeric information.

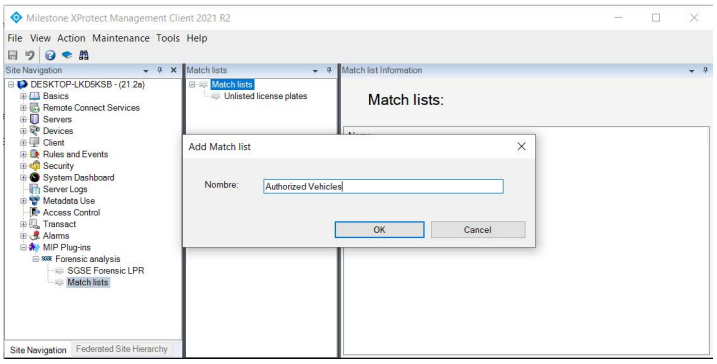
For example, it will be enough to enter a set of digits in the searches so that the Forensic LPR shows us all the different license plates captured with their associated video that contains said digits.

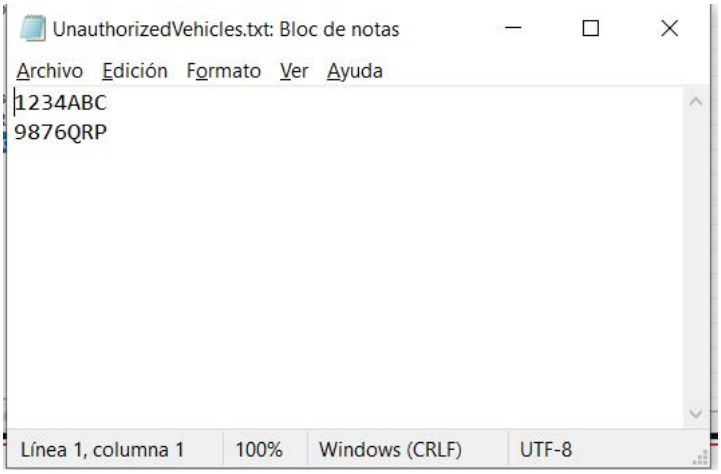


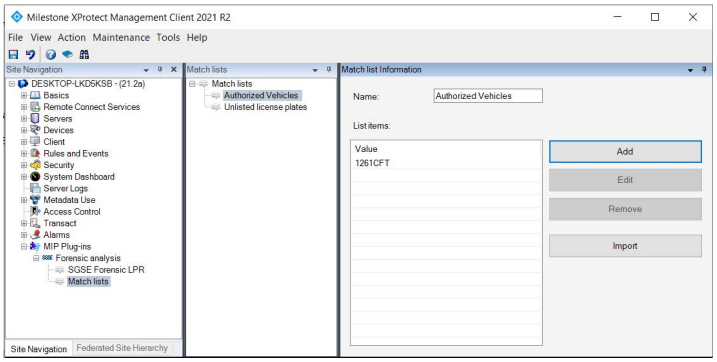
Whitelists and/or blacklists in the Forensic LPR

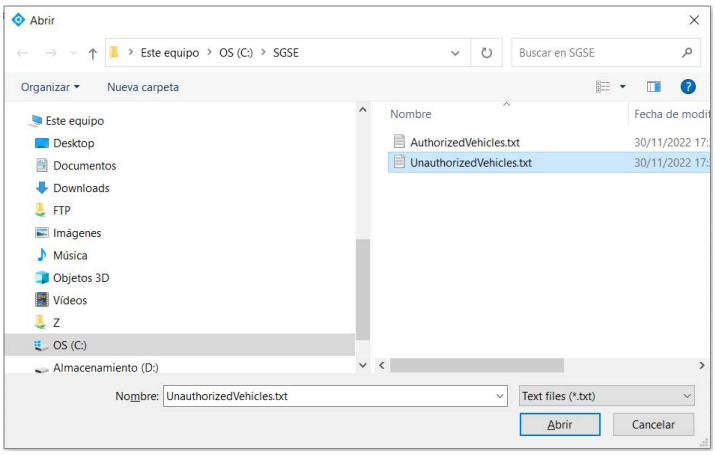
Along with the previous display related to the forensic tools in the recorded video, there is also the option of raising events in the Forensic LPR, thanks to the creation of white and/or blacklists.

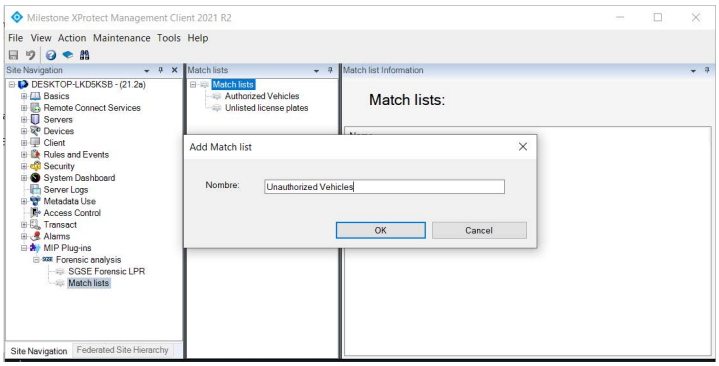
Once the white and/or blacklists have been created as shown in the image below, we can incorporate the license plates of those vehicles that we want to trigger an event when they are captured by certified LPR cameras in the Forensic LPR.

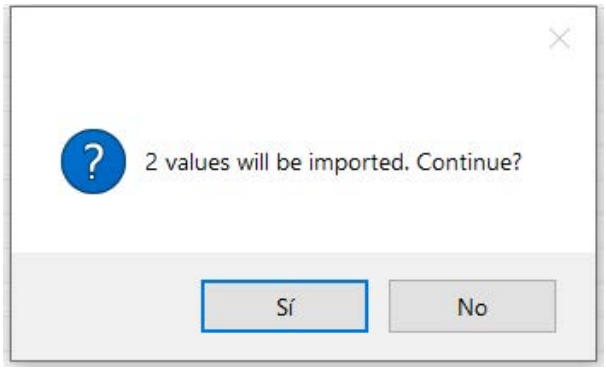


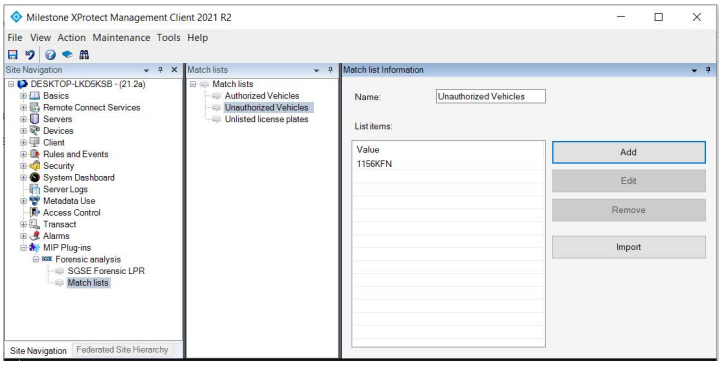


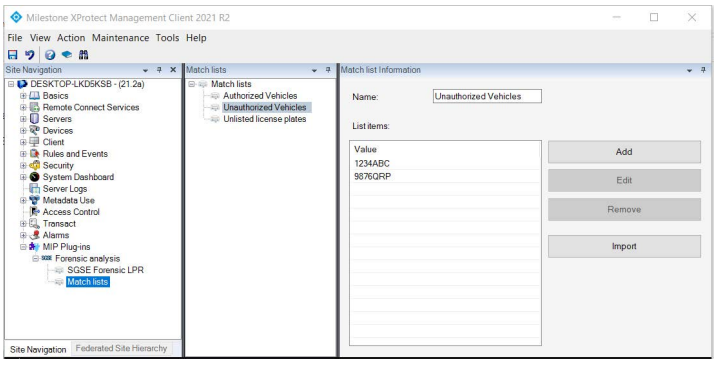












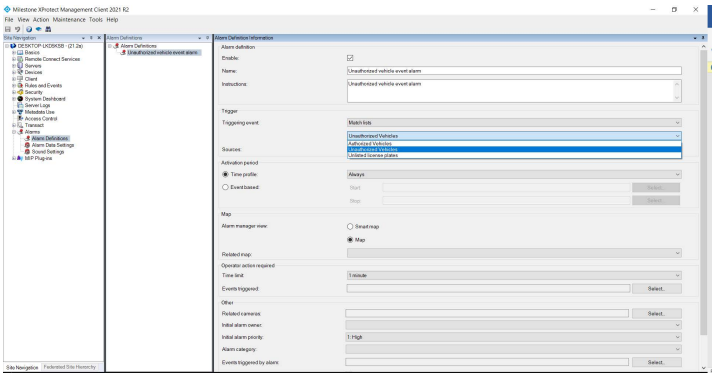
The list of license plates can be easily included by importing a file with the set of information.

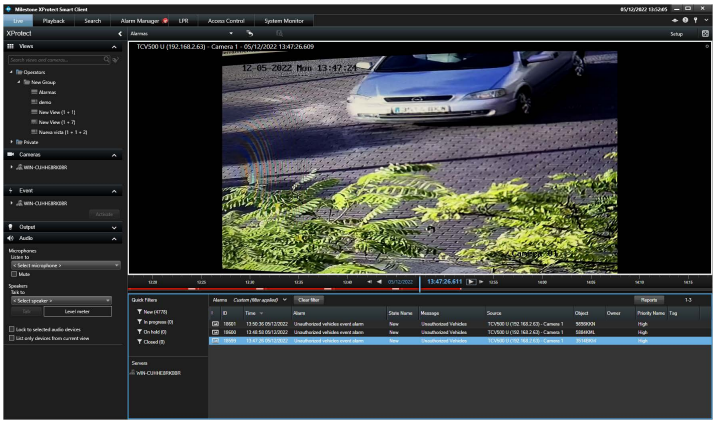
These events allow us to trigger actions within Milestone through the rule engine.

So, for example, we can activate the raising of an exit barrier when a license plate belonging to a list of authorised vehicles (whitelist) is read.

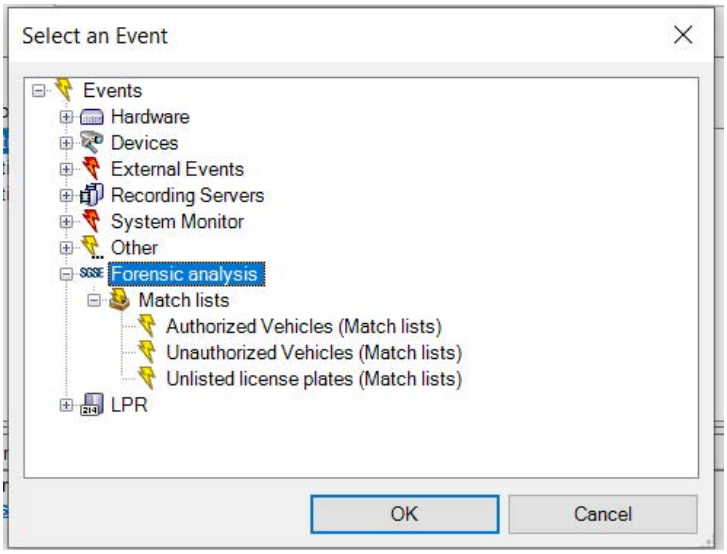
Likewise, we can trigger, for example, the sending of an email or the activation of a red light at an exit when a license plate from a list of unauthorised vehicles is read (blacklist).

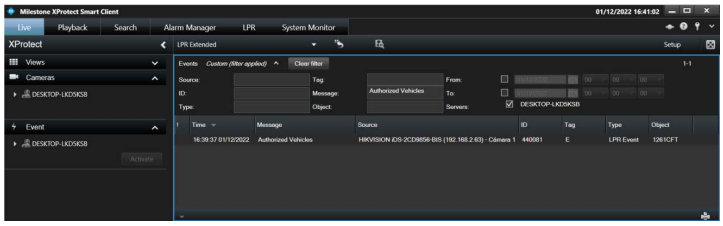
Likewise, we can escalate the events to the alarm category to be managed by the operator.



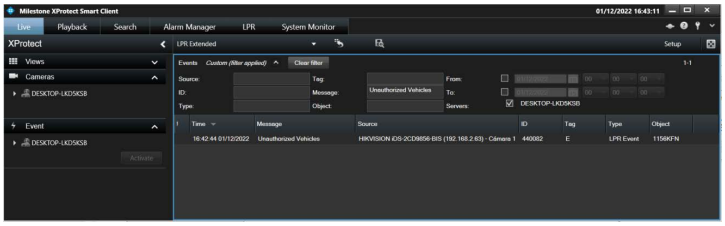


AUTHORISED REGISTRATION EVENT





UNAUTHORIZED REGISTRATION EVENT



PDF reports from the Forensic LPR

Thanks to the Forensic LPR, it is possible to obtain detailed PDF reports with all the information linked to a specific vehicle through its license plate, as illustrated by the following image:

Vehículo Encontrado

Nombre de cámara
SALIDA 3 - HIKVISION iDS-TCM403-BI (192.168.2.64) - Camera 1

Atributos del vehículo evento
31/10/2022 15:47:24.073

Hora de inicio
31/10/2022 15:47:19.073

Hora de finalización
31/10/2022 15:47:29.073

Color
Blanco

Marca
Citroen

Matrícula
8734CVN

País
ESP

Tipo de Matrícula
Vacia

Tipo de vehículo
Coche

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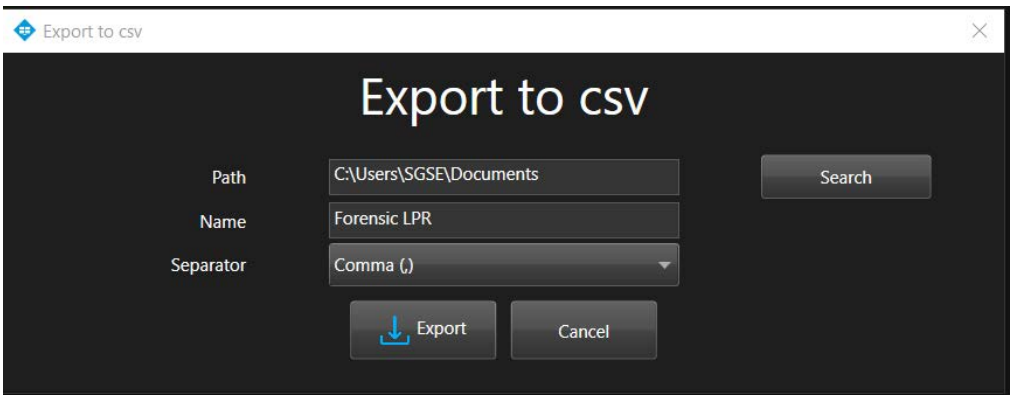
CSV reports from the Forensic LPR

All vehicle information (license plate, characteristics, LPR camera that has captured the information and the date and time) can be obtained in CSV format through the Forensic LPR to be processed in subsequent analysis.



	A	B	C	D	E	F	G	H	I	J	K
1	Device Id	Enter time	Event time	End time	Plate	Color	Brand	Kind	Plate Classification	Country	
2	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:27	30/11/2022 14:27	30/11/2022 14:27	5837GPP	White	Other	Car	Unknown	Unknown	
3	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:27	30/11/2022 14:27	30/11/2022 14:27	unknown	Brown	Other	Car	Unknown	Unknown	
4	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:27	30/11/2022 14:27	30/11/2022 14:27	unknown	White	Other	Car	Unknown	Unknown	
5	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:27	30/11/2022 14:27	30/11/2022 14:27	unknown	Blue	Other	Car	Unknown	Unknown	
6	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:26	30/11/2022 14:26	5508KXM	Blue	Other	Car	Unknown	Unknown	
7	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	unknown	Black	Other	Car	Unknown	Unknown	
8	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	unknown	Grey	Other	Car	Unknown	Unknown	
9	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	6670JLV	White	Other	Car	Unknown	Unknown	
10	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	9898KKN	White	Other	Car	Unknown	Unknown	
11	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	5876LTB	White	Other	Car	Unknown	Unknown	
12	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	2179LSW	White	Other	Car	Unknown	Unknown	
13	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:25	30/11/2022 14:25	30/11/2022 14:25	845LBB	White	Renault	Car	Unknown	Unknown	
14	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:24	30/11/2022 14:25	30/11/2022 14:25	3370SKX	Black	Other	Car	Unknown	Unknown	
15	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:24	30/11/2022 14:24	30/11/2022 14:24	unknown	Blue	Other	Car	Unknown	Unknown	
16	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:24	30/11/2022 14:24	30/11/2022 14:24	9911JCR	Black	Other	Car	Unknown	Unknown	
17	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:24	30/11/2022 14:24	30/11/2022 14:24	unknown	White	Other	Car	Unknown	Unknown	
18	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:23	30/11/2022 14:24	30/11/2022 14:23	unknown	Red	Other	Car	Unknown	Unknown	
19	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:23	30/11/2022 14:23	30/11/2022 14:23	5884KML	Red	Other	Car	Unknown	Unknown	
20	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:23	30/11/2022 14:23	30/11/2022 14:23	3489HCN	White	Other	Car	Unknown	Unknown	
21	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:22	30/11/2022 14:23	30/11/2022 14:23	unknown	White	Other	Car	Unknown	Unknown	
22	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:22	30/11/2022 14:22	30/11/2022 14:22	unknown	Blue	Other	Car	Unknown	Unknown	
23	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:22	30/11/2022 14:22	30/11/2022 14:22	1974MHV	Blue	Other	Car	Unknown	Unknown	
24	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:22	30/11/2022 14:22	30/11/2022 14:22	unknown	White	Other	Car	Unknown	Unknown	
25	HIKVISION iDS-2CD9856-BIS (192.168.2.63) - Cámara 1	30/11/2022 14:22	30/11/2022 14:22	30/11/2022 14:22	3514BKW	Blue	Other	Car	Unknown	Unknown	

LPR cameras certified in the Forensic LPR

The models listed in the table below are currently certified in the Forensic LPR developed by SGSE.

	iDS-TCM403BI-0832	iDS-TCV500-BI/1550	iDS-TCV900-BI/1440	iDS-2CD7A46G0/P-IZHSY	HC121@TCR-08S-Z
Environment	Urban and interurban				
Brand	Hikvision				Uniview
Sensor	1/1.8" CMOS	2/3" GMOS	1" GMOS	1/1.8" CMOS	1/2.8" CMOS
Focal lenght	Motorized 8-32mm	Motorized 15-50mm	Motorized 11-40mm	Motorized 2.8-12mm	Motorized 4.7-47mm
Resolution	4Mpx	5Mpx	9Mpx	4Mpx	2Mpx
Vehicle attributes that can be detected	– License plate – Type of vehicle – Colour (During the day) – Brand – Country of registration	– License plate – Type of vehicle – Colour (During the day) – Brand	– License plate – Type of vehicle – Colour (During the day) – Brand	– Type of vehicle – Country of registration	– Type of vehicle – Colour (During the day)
Compression	H.265 / H.264 / MPEG				
IR range	100 m	30 m	50 m	100 m	50 m
API	ONVIF (S,G) e ISAPI	ONVIF (S,G) e ISAPI	ONVIF (S,G) e ISAPI	PROFILE (S, G, T), ISAPI, SDK, ISUP	ONVIF (S,G) e ISAPI
Operating system	Linux				
Protection	IP66 / IK10	IP66	IP66	IP67 / IK10	IP67 / IK10
Storage	microSD/TF card 128Gb	microSD/TF card 128Gb	microSD/TF card 128Gb	microSD/TF card 256Gb	microSD/TF card 256Gb
Power supply	12VDC, 24VDC, PoE	24VDC, 100 a 240 VAC	24VDC, 100 a 240 VAC	12VDC, PoE	12VDC, 24VDC, PoE
Embedded LPR	Yes Detection rate = 98% Reading rate = 95%	Yes Detection rate = 98% Reading rate = 98%	Yes Detection rate = 98% Reading rate = 98%	Yes Detection rate = 98% Reading ratea = 98%	Yes Detection rate = 98% Reading rate = 95%
Max. pickup speed	160 Km/h	250 Km/h	250 Km/h	100 Km/h	90 Km/h

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