MAKE THE
WORLD SEE

Milestone Systems

XProtect® LPR 2025 R2

Administrator manual

milestone

Contents

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Overview

XProtect LPR for administrators

XProtect LPR enables you to use video-based content analysis (VCA) and recognition of vehicle license plates that interacts with your surveillance system and your XProtect Smart Client.

To read the characters on a plate, XProtect LPR uses optical character recognition on images aided by specialized camera settings.

You can combine LPR (license plate recognition) with other surveillance features such as recording and event-based activation of outputs.

Examples of events in XProtect LPR:

- Activate recordings in a particular quality
- Trigger alarms
- Match against positive and negative match lists
- Open gates
- Switch on lights
- Automatically display incident footage on the screens of designated security staff
- Send text messages to mobile phones.

With an event, you can activate alarms in XProtect Smart Client.

What's new?

In XProtect LPR 2025 R2

Added vehicle properties to match lists

In 2025R1, we introduced vehicle properties to XProtect LPR. In 2025R2, you can now add these vehicle properties to match lists.

For more information, see Match lists on page 52.

Added guidance and best practices around the use of country modules

To provide guidance around the use of country modules in XProtect LPR, we've added a new section explaining what country modules are, the types of country modules we have, what to use them for, and some best practices for how and when to use the different types of country modules, including examples.

For more information, see Country modules on page 26.

In XProtect LPR 2025 R1

Added vehicle properties to searches and in LPR match lists

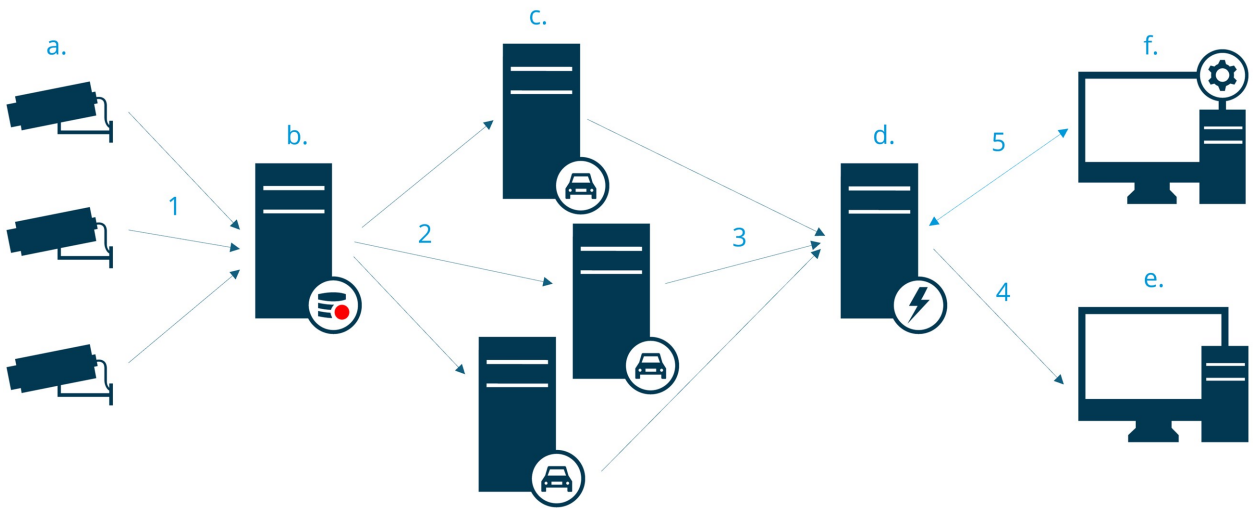
Milestone has added vehicle properties to XProtect LPR. Users of XProtect® LPR in XProtect Smart Client can refine their searches by specifying detailed vehicle properties, such as the make, model, and color of the vehicle.

Users can specify and adjust what vehicle properties they need in the searches on the built-in **Search** tab in XProtect Smart Client or in match lists on the **LPR** tab.

Find a full overview of vehicle properties and their associated values under Overview of vehicle properties on page 30.

XProtect LPR system architecture

Basic data flow:



1. LPR cameras (a) send video to the recording server (b).
2. The recording server sends video to the LPR servers (c) to recognize license plates by comparing them with the license plate styles in the installed country modules.
3. LPR servers send recognitions to the event server (d) to match with the match lists.
4. The event server sends events and alarms to XProtect Smart Client (e) when there is a match.
5. The system administrator manages the entire LPR configuration, for example, setting up events, alarms, and lists in the Management Client (f).

LPR server

The LPR server handles LPR video recorded by your surveillance system. It analyzes the video and sends information to the event server. The event server uses the information to trigger the defined events and alarms. Milestone recommends that you install the LPR server on a computer especially allocated for this purpose.

LPR camera

The LPR camera captures video as any other camera, but some cameras are dedicated for LPR use. The better suited camera you use, the more successful recognitions you will get.

Country module

A country module tells the system how to recognize which license plates come from which countries, states, or regions—based on how the plates look and are structured. See how to enable country modules Country modules tab.

License plate styles

Every country module contains license plate styles. When you enable a country module, all the license plate styles that belong to that country module are also enabled.

A license plate style is a set of characteristics of a license plate. These characteristics include:

- The plate size and shape
- The text format and font
- The colors
- The type of vehicle that the license plate is used on.

See a list of all license plate styles supported by XProtect LPR.

Match list

A match list is a set of license plate numbers, aliases, and/or vehicle properties the system can check for. When a captured license plate matches one on the match list, it can trigger actions like alerts, gate access, or law enforcement notifications. Match lists are used for cases such as security, parking control, tolling, and tracking vehicles of interest.

After you create a match list, you can set up events to recognize license plates on these lists. The events will trigger rules and alarms. See Match lists.

Compatibility

XProtect LPR is compatible with:

- XProtect Corporate
- XProtect Expert
- XProtect Professional+
- XProtect Express+
- Milestone Husky

See also Product comparison chart.

Licensing

XProtect LPR licenses

XProtect LPR requires the following licenses:

- 1 **base license** for XProtect LPR. The base license covers an unrestricted number of LPR servers
- 1 **LPR camera license** per each LPR camera that you want to use in XProtect LPR
- A **LPR country module license** for each country, state, or region that you need in your XProtect LPR solution.

  5 LPR country module licenses are included with the XProtect LPR base license.

  > All country modules are automatically installed when you install your XProtect LPR product. The installed modules are by default disabled and you must enable the modules (see Country modules tab) that you want to use. You can only enable as many country modules as you have LPR country module licenses for.

Example

You have installed 10 country modules, but you only have 5 LPR country module licenses. After you selected the first 5 country modules, you cannot select any more. You must clear some of your selections before you can select other modules.

To find information about the current status of your licenses, see View LPR server information.

To buy additional licenses or country modules, contact your vendor.

Requirements and considerations

System requirements

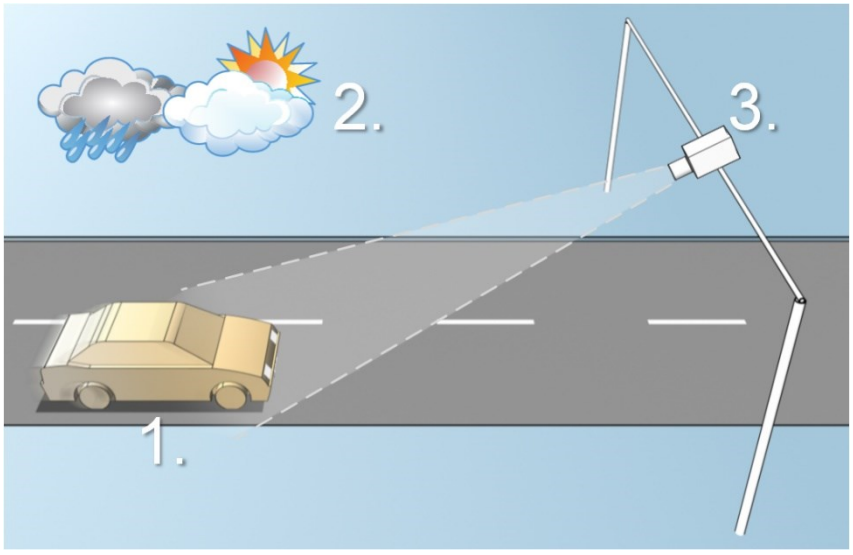
For information about the system requirements for the various VMS applications and system components, go to the Milestone website (https://www.milestonesys.com/systemrequirements/).

Milestone recommends that you install the LPR server on a computer especially allocated for this purpose.

Preparing cameras for license plate recognition

License plate recognition (LPR) differs from other kinds of video surveillance. Normally, you choose cameras based on their ability to provide the best possible images for viewing by the human eye. When you choose cameras for LPR, only the area where you expect to detect license plates is important. The clearer and consistent you capture an image in that small area, the higher recognition rate you will get.

This section helps you prepare cameras for license plate recognition, but it also introduces you to important theories about cameras and lenses that are crucial to understand in order to get optimal images.



Factors that influence your configuration of LPR:

1. Vehicle	2. Physical surroundings	3. Camera
• Speed • Plate size and position	• Lighting conditions • Weather	• Exposure • Field of view • Shutter speed • Resolution • Positioning

It is important to take these factors into consideration as they have a critical influence on successful license plate recognition. You must mount cameras and configure XProtect LPR in a way that matches each specific environment.

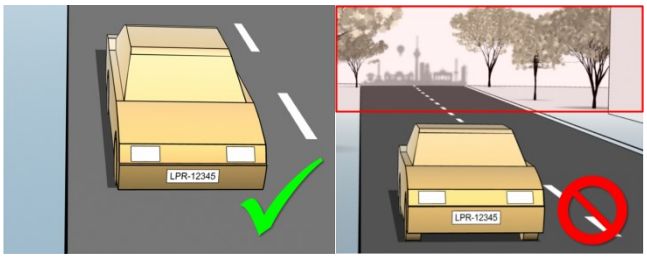
You cannot expect the product to run successfully without configuration. A camera used for LPR has a CPU consumption that is about five times higher than a normal camera. If a camera has not been set up correctly, it will greatly affect the level of successful recognitions and the CPU performance.

Positioning the camera

When you mount cameras for LPR use, it is important to get a good, clear view of the area of interest so the plate can be detected consistently. This ensures the best possible performance and low risk of false detection:

- The area should cover only the part of the image where the license plate is visible as the vehicle moves in and out of the image
- Avoid to have objects that block the view path of the camera, such as pillars, barriers, fences, gates
- Avoid irrelevant moving objects such as people, trees, or traffic in

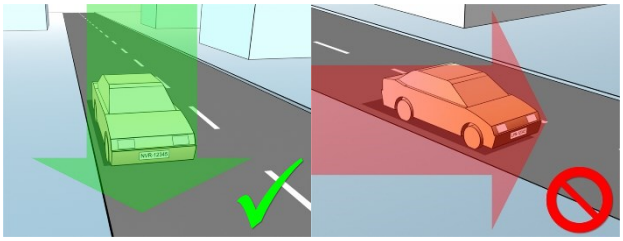
If too many irrelevant items are included, they will interfere with the detection, and the LPR server will use CPU resources on analyzing irrelevant items instead of license plates.



To help you obtain a clear and undisturbed view, you can:

- Mount the camera as close as possible to the area of interest
- Adjust camera angles
- Zoom. If you zoom, always use the camera's optical zoom

Mount the camera so the license plate appears from the top of the image (or bottom if traffic is driving away from the camera) instead of from the right or left side. In this way you make sure that the recognition process of a license plate only starts when the whole plate is in the view:



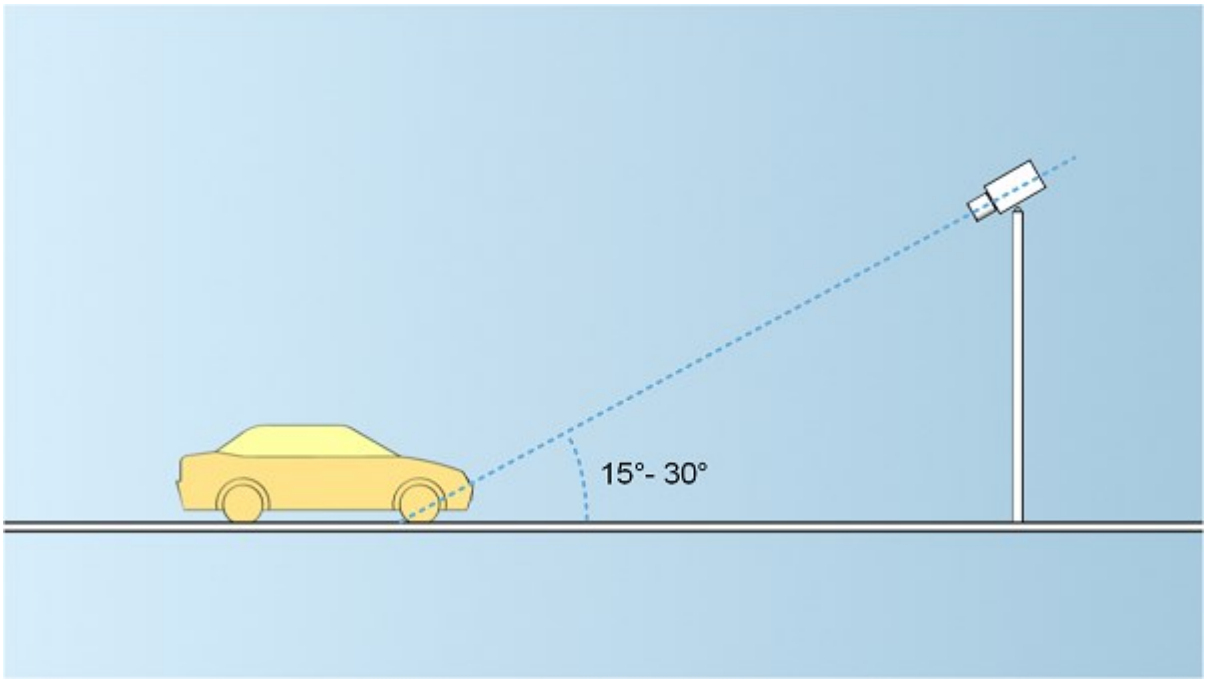
Camera angles

Single-line rule

Mount the camera so that you can draw a horizontal line that crosses both the left and right edge of the license plate in the captured images. See the illustrations below for correct and incorrect angles for recognition.

Vertical angle

The recommended vertical view angle of a camera used for LPR is between 15°-30°.



Horizontal angle

The recommended maximum horizontal view angle of a camera used for LPR is between 15°-25°.

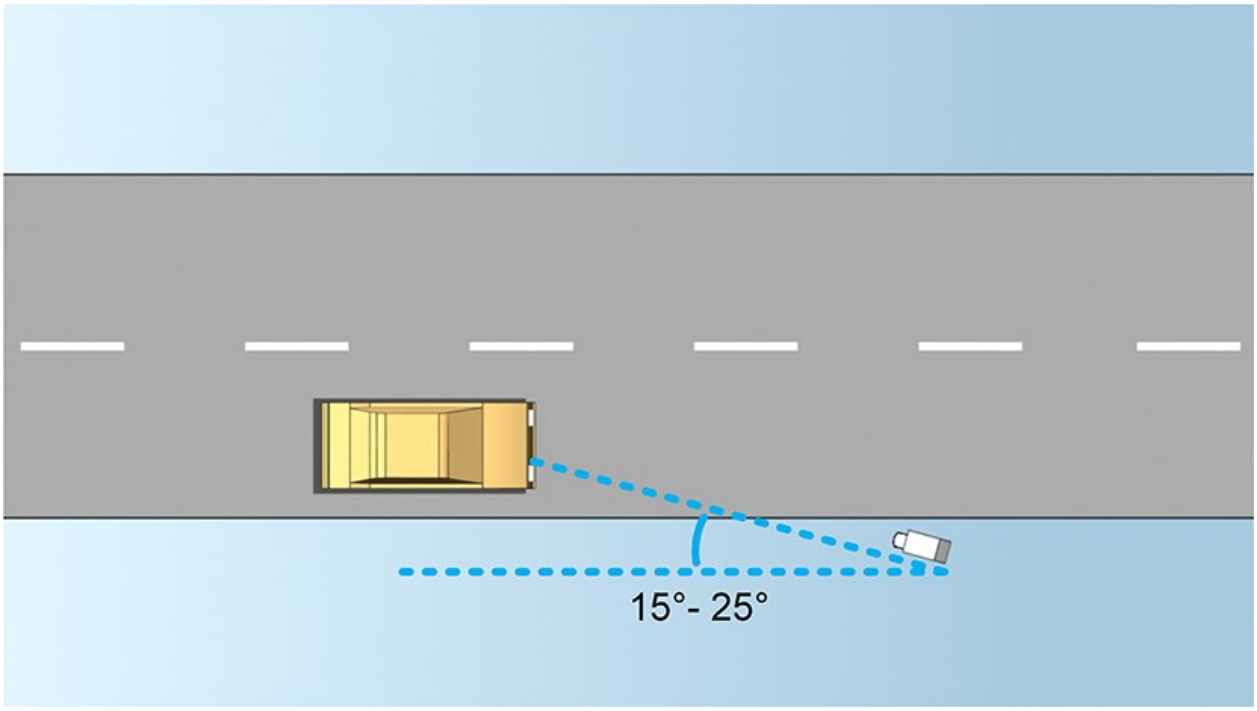
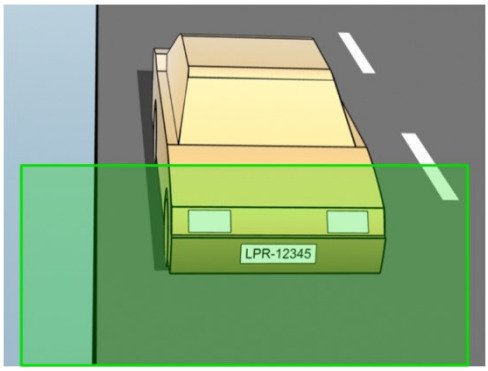


Plate width recommendations

Mount the camera so that the ideal snapshot of the license plate is captured when the license plate is in the center or lower half of the image:



Take a snapshot and make sure that the requirements to stroke width and plate width as described below are fulfilled. Use a standard graphics editor to measure the amount of pixels. When you start the process of reaching the minimum plate width, begin with a low resolution on the camera, and then work your way up in a higher resolution until you have the required plate width.

Stroke width

The term pixels per stroke is used to define a minimum requirement for fonts that should be recognized. The following illustration outlines what is meant by stroke:

Because the thickness of strokes depend on the country and on the license plate style, measurements like pixels/cm or pixels/inch are not used.

The resolution for best LPR performance should be at least 2.7 pixels/stroke.

Plate width

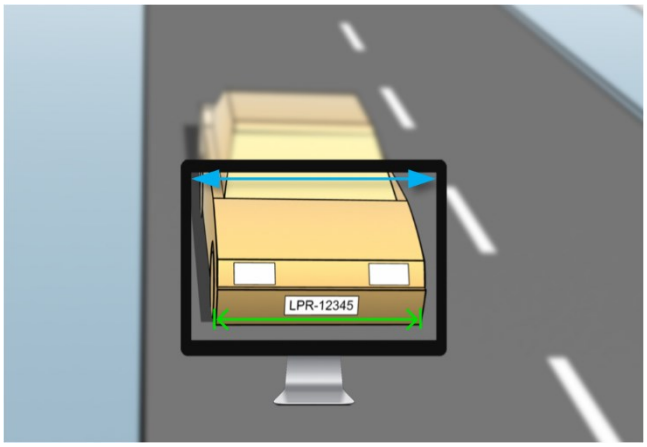
Plate type	Plate width	Setup	Minimum plate width (pixels)
Single line US plates	• Plate width 12 inches • Stroke width around ¼ inches	Vehicles stopped; no interlacing	130
		Vehicles are moving; interlaced	215
Single line European plates	• Plate width 52 cm • Stroke width around 1 cm	Vehicles stopped; no interlacing	170
		Vehicles are moving; interlaced	280

If vehicles are moving when recorded, and an interlaced camera is used, only a half of the image can be used (only the even lines) for recognition compared with a camera configured for stopped vehicles and no interlacing. This means that the resolution requirements are almost double as high.

Image resolution

Image quality and resolution is important for a successful license plate recognition. On the other hand, if the video resolution is too high, the CPU might be overloaded with the risk of skipped or faulty detections. The lower you can set the acceptable resolution, the better CPU-performance and the higher detection rate you get.

In this example we explain how to do a simple image quality calculation and find a suitable resolution for LPR. The calculation is based on the width of a car.



We estimate that the horizontal width is 200 cm/78 inches, as we assume the width of a standard car is 177 cm/70 inches, and besides that we add ~10% for the extra space. You can also do a physical measuring of the area of interest if you need to know the exact width.

The recommended resolution of the stroke thickness is 2.7 pixels/stroke, and the physical stroke thickness is 1 cm for a European plate and 0.27 inches for a US plate. This gives the following calculation:

Calculation for European plates in cm

200 × 2.7 ÷ 1 = 540 pixels

Recommended resolution = VGA (640×480)

Calculation for US plates in inches

78 × 2.7 ÷ 0.27 = 780 pixels

Recommended resolution = SVGA (800×600)

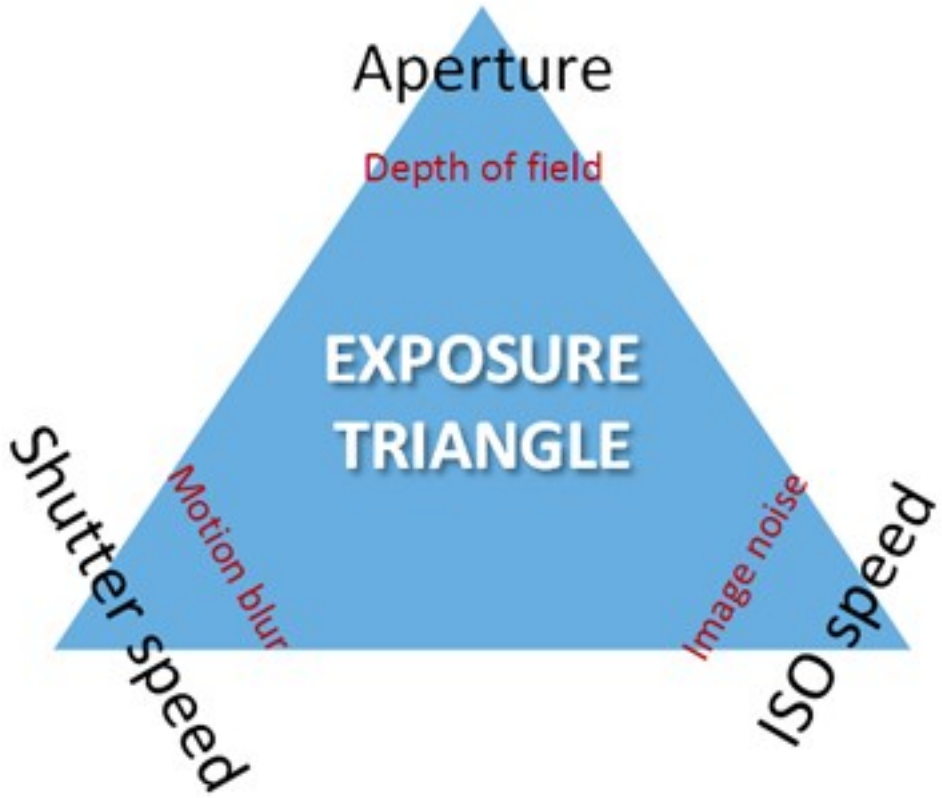
Because US plates use a font with a narrow stroke, a higher resolution is needed than for European plates.

Common video resolutions

Name	Pixels (width × height)
QCIF	176×120
CIF	352×240
2CIF	704×240
VGA	640×480
4CIF	704×480
D1	720×576
SVGA	800×600
XGA	1024×768
720p	1280×1024

Understanding camera exposure

Camera exposure determines how light/dark and sharp/blurry an image appears when it has been captured. This is determined by three camera settings: aperture, shutter speed, and ISO speed. Understanding their use and interdependency can help you to set up the camera correctly for LPR.



You can use different combinations of the three settings to achieve the same exposure. The key is to know which trade-offs to make, since each setting also influences the other image settings:

Camera settings	Controls...	Affects...
Aperture	The adjustable opening that limits the amount of light to enter the camera	Depth of field
Shutter speed	The duration of the exposure	Motion blur
ISO speed	The sensitivity of the camera's sensor to a given amount of light	Image noise

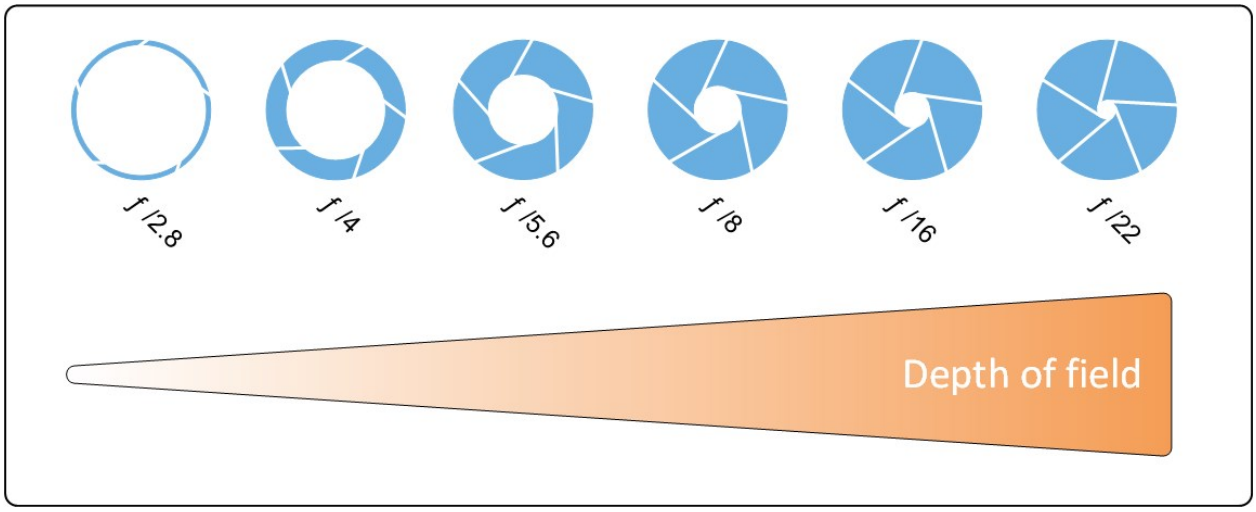
The next sections describe how each setting is specified, what it looks like, and how a given camera exposure mode affects this combination:

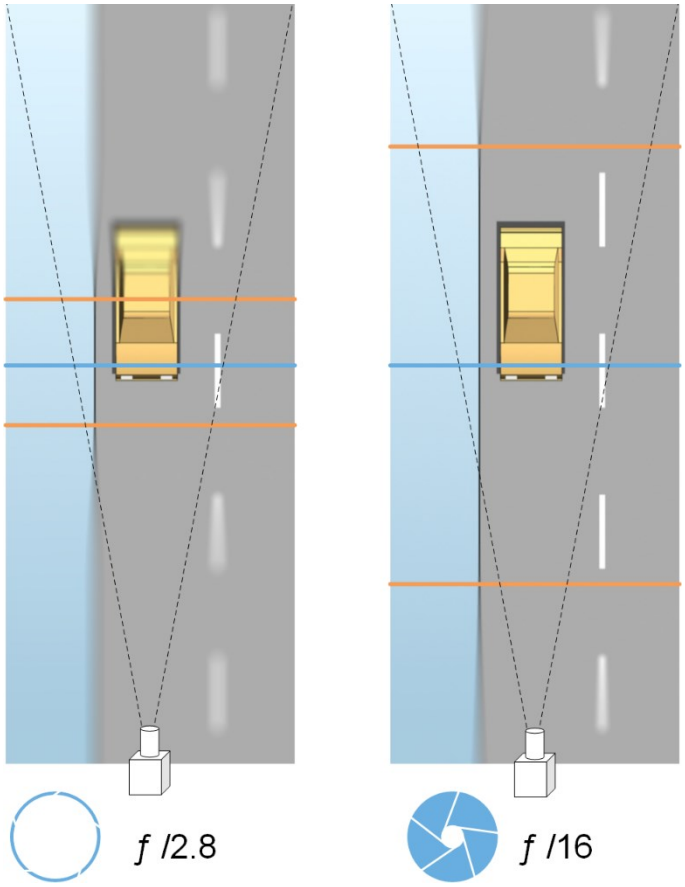
Aperture settings

The aperture setting controls the amount of light that enters your camera from the lens. It is specified in terms of an f-stop value, which can at times be counterintuitive, because the area of the opening increases as the f-stop decreases.

Low f-stop value/wide aperture = shallow depth of field

High f-stop value/narrow aperture = large depth of field





The example illustrates how the depth of field is affected by the f-stop value. The blue line indicates the focus point.

A high f-stop value makes it possible to have a longer distance where the license plate is in focus. Good light conditions are important for sufficient exposure. If lighting conditions are insufficient, the exposure time needs to be longer, which again increases the risk of getting blurry images.

A low f-stop value reduces the focus area and thereby the area used for recognition, but is suitable for conditions with low light. If it is possible to ensure that vehicles are passing the focus area at a low speed, a low f-stop value is suitable for a consistent recognition.

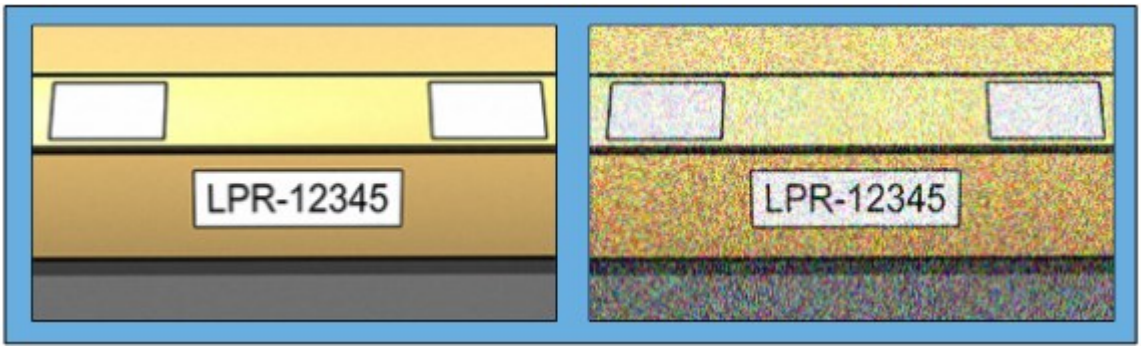
Shutter speed

A camera's shutter determines when the camera sensor is open or closed for incoming light from the camera lens. The shutter speed refers to the duration when the shutter is open and light can enter the camera. Shutter speed and exposure time refer to the same concept, and a faster shutter speed means a shorter exposure time.

Motion blur is undesired for license plate recognition and surveillance. In many occasions vehicles are in motion while license plates are detected which makes a correct shutter speed an important factor. The rule of thumb is to keep the shutter speed high enough to avoid motion blur, but not too high as this may cause under-exposed images depending on light and aperture.

ISO speed

The ISO speed determines how sensitive the camera is to incoming light. Similar to shutter speed, it also correlates 1:1 with how much the exposure increases or decreases. However, unlike aperture and shutter speed, a lower ISO speed is in general desirable, since higher ISO speeds dramatically increase image noise. As a result, ISO speed is usually only increased from its minimum value if the desired image quality is not obtainable by modifying the aperture and shutter speed settings solely.



Low ISO speed image vs High ISO speed image

Common ISO speeds include 100, 200, 400 and 800, although many cameras also permit lower or higher values. With digital single-lens reflex (DSLR) cameras, a range of 50-800 (or higher) is often acceptable.

Physical surroundings

When you mount and use cameras for LPR, note the following factors related to the surroundings:

Too much light

Too much light in the surroundings can lead to overexposure or smear:

- Overexposure is when images are exposed to too much light, resulting in a burnt-out and overly white appearance. To avoid overexposure, Milestone recommends that you use a camera with a high dynamic range and/or use an auto-iris lens
- Iris is the adjustable aperture. For that reason, iris has a significant effect on the exposure of images

- Smear is an effect from overexposure that leads to unwanted light vertical lines in images. It is often caused by slight imperfections in the cameras' charge-coupled device (CCD) imagers. The CCS imagers are the sensors used to digitally create the images

Too little light

Too little light in the surroundings or too little external lighting can lead to underexposure.

- Underexposure is when images are exposed to too little light, resulting in a dark image with hardly any contrast (see Contrast on page 24). When auto-gain (see Unwanted camera features on page 24) cannot be disabled or when you are not able to configure a maximum allowed shutter time (see Lens and shutter speed on page 23) for capturing moving vehicles, too little light will initially lead to gain noise and motion blur in the images, and ultimately to underexposure

  To avoid underexposure, use sufficient external lighting and/or use a camera that has sufficient sensitivity in low-light surroundings without using gain

- Infrared is another way to overcome difficult lighting conditions. You can use artificial infrared lighting combined with an infrared-sensitive camera with an infrared pass filter. Retro-reflective license plates are particularly suitable for use with infrared lighting:

  - Retro-reflectivity is achieved by covering surfaces with a special reflective material which sends a large portion of the light from a light source straight back along the path it came from. Retro-reflective objects appear to shine much more brightly than other objects. This means that at night they can be seen clearly from considerable distances. Retro-reflectivity is frequently used for road signs, and is also used for different types of license plates

- Weather conditions, such as snow or very bright sunlight may for example require special configuration of cameras

- License plate condition: Vehicles may have damaged or dirty license plates. Sometimes this is done deliberately in an attempt to avoid recognition

Lens and shutter speed

When configuring camera lenses and shutter speeds for LPR, note the following:

- Focus: Always make sure the license plate is in focus
- Auto-iris: If using an auto-iris lens, always set the focus with the aperture as open as possible. In order to make the aperture open, you can use neutral density (ND) filters or—if the camera supports manual configuration of the shutter time—the shutter time can be set to a very short time
    - Neutral Density (ND) filters or gray filters basically reduce the amount of light coming into a camera. They work as "sunglasses" for the camera. ND filters affect the exposure of images (see Understanding camera exposure on page 18)
- Infrared: If using an infrared light source, focus may change when switching between visible light and infrared light. You can avoid the change in focus by using an infrared compensated lens, or by using an infrared pass filter. If you use an infrared pass filter, an infrared light source is required—also during daytime
- Vehicle speed: When vehicles are moving, cameras' shutter time should be short enough to avoid motion blur. A formula for calculating the longest suitable shutter time is:
    - Vehicle speed in km/h: Shutter time in seconds = 1 second / (11 × max vehicle speed in kilometers per hour)
    - Vehicle speed in mph: Shutter time in seconds = 1 second / (18 × max vehicle speed in miles per hour)

  where / denotes "divided by" and × denotes "multiplied by."

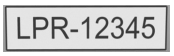
The following table provides guidelines for recommended camera shutter speeds for different vehicle speeds:

Shutter time in seconds	Maimum vehicle speed in kilometers per hour	Maximum vehicle speed in miles per hour
1/50	4	2
1/100	9	5
1/200	18	11
1/250	22	13
1/500	45	27

Shutter time in seconds	Maimum vehicle speed in kilometers per hour	Maximum vehicle speed in miles per hour
1/750	68	41
1/1000	90	55
1/1500	136	83
1/2000	181	111
1/3000	272	166
1/4000	363	222

Contrast

When you determine the right contrast for your LPR camera, consider the difference in gray value (when images are converted to 8-bit grayscale) between the license plate's characters and the license plate's background color:

Good contrast	Acceptable contrast; recognition is still possible
	

Pixels in an 8-bit grayscale image can have color values ranging from 0 to 255, where grayscale value 0 is absolute black and 255 is absolute white. When you convert your input image to an 8-bit grayscale image, the minimum pixel value difference between a pixel in the text and a pixel in the background should be at least 15.

Noise in the image (see Unwanted camera features on page 24), the use of compression (see Unwanted camera features on page 24), the light conditions, and similar can make it difficult to determine the colors of a license plate's characters and background.

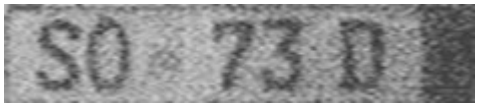
Unwanted camera features

When you configure cameras for LPR, note the following:

Automatic gain adjustment

One of the most common types of image interference caused by cameras is gain noise.

- Gain is the way that a camera captures a picture of a scene and distributes light into it. If light is not distributed optimally in the image, the result is gain noise.

  Controlling gain requires that complex algorithms are applied, and many cameras have features for automatically adjusting gain. Unfortunately, such features are rarely helpful in connection with LPR. Milestone recommends that you configure your cameras' auto-gain functionality to be as low as possible. Alternatively, disable the cameras' auto-gain functionality.

  In dark surroundings, you can avoid gain noise by installing sufficient external lighting.

Automatic enhancement

Some cameras use contour, edge or contrast enhancement algorithms to make images look better to the human eye. Such algorithms can interfere with the algorithms used in the LPR process. Milestone recommends that you disable the cameras' contour, edge and contrast enhancement algorithms whenever possible.

Automatic compression

High compression rates can have a negative influence on the quality of license plate images. When a high compression rate is used, more resolution (see Plate width recommendations on page 15) is required in order to achieve optimal LPR performance. If a low JPEG compression is used, the negative impact on LPR is very low, as long as the images are saved with a JPEG quality level of 80% or above, and images have normal resolution, contrast and focus as well as a low noise level.

Acceptable	Unacceptable
	
License plate image saved with a JPEG quality level of 80% (i.e. low compression).	License plate image saved with a JPEG quality level of 50% (i.e. high compression).

Country modules

Country modules are libraries that the LPR server uses to detect license plates from each country, and, in larger countries, different states or regions. They typically include information about the allowed letters and digits, possible fonts, the layout of symbols on the plate, and any visible markings like stickers that might be present on the license plate.

The LPR server uses information from country modules to determine if the plate image is from the corresponding country or state. It also uses this information to construct the registration number according to local Department of Motor Vehicles (DMV) rules.

Using country modules

Your organization must choose which country modules to activate based on your use case. The LPR Server uses the activated country modules to detect the symbols on a plate. When the detection is complete, the LPR server returns an answer from the country module that can confirm the license plate's origin, and the accuracy of the symbol that has been read with the highest confidence.

Every country module categorizes recognitions with specific plate styles. Use these plate styles to more accurately define the type of vehicle, such as electric, military, or emergency vehicles .

Generic country modules

Some country modules are marked as "generic."

These modules do not thoroughly confirm whether the license plate is from a specific country or state. Instead, they read the symbols on the license plate and return them, regardless of the country or state of origin.

Generic country modules vary based on specific target areas. For example, the shapes and fonts used in North America differ significantly from those used in Europe. For this reason, some generic country modules are designed with upfront knowledge aimed at a specific region.

The LPR server does not use the outcome of generic country modules if there is an answer from a regular (non-generic) country module. This rule applies even if a generic country module provides a higher confidence level than a regular country module.

You can consider generic country modules as a fallback approach to providing at least some answers to the properties of a license plate.

A couple of general rules:

- For identification, generic country modules generally start with X_, such as X_EU, X_USA, and X_AUS.
- The output country or state is the identifier of the generic module that reads it (such as "X_EU" or "X_USA").
- One exception is the Canadian CDN module: it reads any Canadian license plate but does not report the state of origin (always "CDN").

Generic country modules with some country/state identification

Some generic modules read plates from regions like Europe or the USA and try to guess the country or state of origin within that region.

These types of results typically have a lower confidence level but can help fulfill the region's project requirements for full LPR coverage.

The accuracy is lower than using regular country modules. However, when you combine the generic country modules with four or five regular country modules, they can provide a good solution for region-wide LPR accuracy.

These types of country modules usally have the same names as the generic country modules but without the X_ prefix.

For example, the EU country module works like the X_EU country module, but instead of always returning "X_EU" answers, the EU will give low-confidence country codes. Examples of generic country modules are EU, USA, and X_EE.

Even if a country is identified, the generic country module does not follow the same validation process as specific country modules. There might be slight differences in formatting and validation between the two modules.

Fallback X_XX

If the regular and generic country modules cannot read the plate, or if no generic country module is loaded, the LPR server will still try to provide a textual representation of the symbols on the plate. If it is successful, the symbols are returned as an X_XX answer with very low confidence (always lower than 50%).

You can use the X_XX answers for tasks like sloppy matching to blacklists or improving customer experience. Sloppy matching means matching license plate symbols to a list or database without requiring an exact match.

There is also an X_XX generic country module, which is no longer maintained. However, it is included in XProtect LPR for backward compatibility.

Other generic country modules

There are two "generic" country modules (indicated by the X_ prefix) that have been designed to read specific non-license plates:

- X_DG, which reads square orange dangerous goods plaques.
- X_BIC, which reads horizontally-oriented BIC-style container codes.

Disclaimer: The detection and identification of X_DG and X_BIC are less accurate than reading license plates.

The performance on LPR is highly dependent on factors such as camera position, camera angle, the condition of the plate material, and overall image quality.

With this disclaimer in mind, Milestone recommends using these modules only in controlled environments.

Code	Description	Module required	Country guessing	Primary region	Secondary regions	Deprecated
X_EU	Read EU letters and digits	yes	no	Europe	Africa, Asia	no
X_USA	Read USA letters and digits	yes	no	North America	Latin America	no
X_AUS	Read AUS letters and digits	yes	no	Oceania	none	no
X_XX	Read any Western letters and digits	yes	no	World	none	yes
X_NR	Read numbers	yes	no	Middle East	Other applications	no
CDN	Read Canadian license plates	yes	no	Canada	North America	no
EU	X_EU + country guessing	yes	yes	Europe	none	no
USA	X_USA + state guessing	yes	yes	North America	none	no
X_XX	Fallback from Intrada reading any symbols	no	no	World	none	no

Code	Description	Module required	Country guessing	Primary region	Secondary regions	Deprecated
X_EE	Eastern Europe	yes	yes	AL, BIH, BY, MD, MK, MNE, RUS, RKS, SRB, VY	none	no

Best practices for using country modules in XProtect LPR

Activating the right number of country modules is essential for accurate license plate recognition while maintaining system performance.

- Activating too many modules can degrade performance, causing slow recognition or, in extreme cases, system failure.
- Activating too few modules might result in missing license plates from relevant regions, leading to incomplete results.
- **Recommendation:** Use around five country modules.
- **Warning:** Avoid using more than ten country modules due to performance issues.
- **Which country modules to use:** Prioritize the country modules that are closest to your geographic area or most frequently seen in your region.
- **When to use generic country modules:** Use generic country modules for license plates that are not regularly seen in your area, such as those from uncommon countries or states in your region. These modules are also useful when only letters and country codes must be detected.

When you use a generic country module with guessing, make sure to select the **Unknown** check box in the **Country Filter** on the **LPR** tab in the XProtect Smart Client, otherwise you won't see any guessed results.

Example: A large country with multiple regions

In a large country with multiple regions, customers might need to recognize license plates from different areas. Some country modules can detect plate styles (types of license plates), while the generic country module only recognizes the number and region.

Customers in such countries often want to activate all available regional modules, which can lead to performance issues. The system processes data from module to module, increasing processing time. However, in most cases, registered license plates are primarily from the region where the system is activated.

Recommendation: Activate the module for your region plus the generic country module to ensure performance without unnecessary processing.

Example: Border regions with high traffic from neighboring countries

In border regions, vehicles frequently cross from multiple neighboring countries, requiring recognition of plates from various national systems.

Recommendation: Activate the country modules for the primary neighboring countries, and the broader regional modules that cover other commonly seen license plates.

Example: Urban areas with a mix of local and out-of-region vehicles

In a major city, most detected license plates typically belong to local vehicles, but a significant number can come from other regions due to tourism, commuting, or business travel.

Recommendation: Activate the country module for your city's region plus a generic country module. If a specific neighboring region contributes a large volume of traffic, consider adding its module as well.

Example: An Industrial zones with frequent international traffic

An industrial zone near shipping ports or major highways sees a high volume of trucks and commercial vehicles from multiple regions or countries. These vehicles may have specialized or non-standard license plate formats.

Recommendation: Activate the country modules for the main regions where trucks and commercial vehicles originate. If vehicles come from a wide range of locations, use a combination of relevant country modules and the generic module to ensure broad coverage without overloading the system.

Overview of vehicle properties

Users of XProtect® LPR in XProtect Smart Client can refine their searches by specifying detailed vehicle properties.

Users can specify and adjust vehicle properties through the built-in **Search** tab in XProtect Smart Client or the LPR tab, which is added to the XProtect Smart Client user interface during the installation of XProtect® LPR.

By including detailed properties like make, model, color, type, or side in searches, users can:

- Focus their search on finding the relevant vehicles.
- Track incidents more efficiently.
- Monitor activity effectively.
- Quickly access more accurate data about the vehicle.

All vehicle properties are available to users in XProtect Smart Client when XProtect® LPR has been installed. No configuration is required.

Find the details about the available vehicle properties and their associated values in these sections.

Currently, the detection accuracy for XProtect® LPR is highest for vehicles produced in Europe. For optimal circumstances for recognition, the full front and rear of the vehicle must be visible in the camera.

Milestone cannot guarantee accuracy in detecting the listed vehicle properties. The quality of your organization's hardware, configuration, camera setup, and environmental conditions can affect your results.

Types of vehicle properties

XProtect LPR includes the following vehicle properties.

Property	Definition
Make	The manufacturer or brand of the vehicle (such as BMW, Saab, or Kia).
Model	The specific vehicle model associated with the make (such as Ford Transit or Citroën Berlingo).
Type	The general type or category of the vehicle (such as car, motorcycle, or bus).
Color	The primary exterior color of the vehicle (such as red, black, or blue).
Side	The visible side of the vehicle that XProtect LPR has captured (such as front or rear).

Overview of vehicle property values

The table below includes a complete overview of vehicle property values for make, model, type, color, and side.

Property	Values
Make	Undetectable, Unknown, Alfa Romeo, Audi, BMW, Burg, Chevrolet, Chrysler, Citroen, Dacia, Daewoo, DAF, Daihatsu, Dodge, Fiat, Floor, Ford, Groenewegen, H.T.F, Hapert,

Property	Values
	Honda, Hyundai, Iveco, Jaguar, Jeep, Kia, Krone, LAG, Lancia, Land Rover, Lexus, MAN, Mazda, Mercedes-Benz, Mini, Mitsubishi, Nissan, Opel, Pacton, Peugeot, Porsche, Renault, Saab, Scania, Schmitz, Schmitz Cargobull, Seat, Skoda, Smart, Subaru, Suzuki, Tesla, Toyota, Van Eck, Van Hool, Volkswagen, Volvo.
Model	Undetectable, Unknown, Alfa Romeo - 147, Alfa Romeo - Alfa Giulietta, Alfa Romeo - Mito, Audi - A1, Audi - A3, Audi - A4, Audi - A5, Audi - A6, Audi - TT, BMW - 1, BMW - 116i, BMW - 3, BMW - 320ed, BMW - 320i, BMW - 5, BMW - 520d, BMW - X, Chevrolet - Spark, Citroen - Berlingo, Citroen - C1, Citroen - C2, Citroen - C3, Citroen - C4, Citroen - C5, Citroen - DS3, Citroen - Xsara Picasso, Dacia - Logan, Dacia - Sandero, DAF - CF 400 FT, DAF - FAR XF105, DAF - FTG XF105, DAF - FTP XF105, DAF - FT CF85, DAF - FT XF, DAF - FT XF105, DAF - FT XF 105, DAF - XF 440 FT, DAF - XF 460 FT, Daihatsu - Cuore, Daihatsu - Sirion, Fiat - 500, Fiat - Doblo, Fiat - Ducato, Fiat - Panda, Fiat - Punto, Ford - C-Max, Ford - Fiesta, Ford - Focus, Ford - Focus C-Max, Ford - Fusion, Ford - Galaxy, Ford - Ka, Ford - Mondeo, Ford - S-Max, Ford - Transit, Honda - Civic, Honda - Insight, Honda - Jazz, Hyundai - Getz, Hyundai - i20, Hyundai - ix35, Hyundai - i10, Hyundai - i30, Hyundai - Tucson, Iveco - AS440T/P, Kia - Cee'd, Kia - Picanto, Kia - Rio, Kia - Sportage, Krone - N A, Krone - SD, Lexus - CT200h, MAN - TGS, MAN - TGX, Mazda - 2, Mazda - 3, Mazda - 6, Mazda - CX-5, Mercedes-Benz - 639 Vito 109 CDI, Mercedes-Benz - A, Mercedes-Benz - Actros, Mercedes-Benz - B, Mercedes-Benz - C, Mercedes-Benz - Citan, Mercedes-Benz - E, Mercedes-Benz - Sprinter, Mercedes-Benz - Vito, Mini - Cooper, Mini - Mini, Mitsubishi - Colt, Mitsubishi - Outlander, Mitsubishi - Space Star, Nissan - Micra, Nissan - Note, Nissan - Qashqai, Opel - Agila, Opel - Ampera, Opel – Astra, Opel - Combo Van, Opel - Corsa, Opel - Insignia Sports Tourer SW, Opel - Meriva, Opel - Movano, Opel - Vivaro, Opel - Zafira, Peugeot - 107, Peugeot - 2008, Peugeot - 206, Peugeot - 207, Peugeot - 208, Peugeot - 3008, Peugeot - 307, Peugeot - 308, Peugeot - 407, Peugeot - 5008, Peugeot - 508, Peugeot - Expert, Peugeot - Partner, Renault - Captur, Renault - Clio, Renault - Espace, Renault - Kangoo, Renault - Laguna, Renault - Master, Renault - Megane, Renault - Megane Scenic, Renault - Modus, Renault - T, Renault - Trafic, Renault - Twingo, Saab - 9-3, Saab - 9-5, Scania - R410, Scania - R450, Scania - R 420 A 4x2, Scania - R 440 A 4x2, Schmitz - Unknown, Seat - Altea, Seat - Ibiza, Seat - Leon, Seat - Mii, Skoda - Fabia, Skoda - Octavia, Skoda - Superb, Suzuki - Alto, Suzuki - Swift, Suzuki - SX4, Toyota - Auris, Toyota - Avensis, Toyota - Aygo, Toyota - Corolla, Toyota - Prius, Toyota - RAV4, Toyota - Yaris, Volkswagen - Caddy, Volkswagen - Crafter, Volkswagen - Fox, Volkswagen - Golf, Volkswagen - Jetta, Volkswagen - Lupo, Volkswagen - Passat, Volkswagen - Polo, Volkswagen - Tiguan, Volkswagen - Touran, Volkswagen - Transporter, Volkswagen - Up, Volvo - C30, Volvo - FH, Volvo - FM, Volvo - S, Volvo – V, Volvo – XC.

Property	Values
Type	Undetectable, Unknown, bus, motorcycle, car, truck, van.
Color	Undetectable, Unknown, black, blue, gray, green, red, white, yellow.
Side	Undetectable, Unknown, front, rear.

Installation

Install XProtect LPR

Considerations

To run XProtect LPR, you must install:

- At least one LPR server
- The XProtect LPR plug-in on all computers that run the Management Client, the event server, and XProtect Smart Client
- Make sure that the user selected for running the LPR Server service can access the Management Client

Milestone recommends that you install the LPR server on a different computer than your management server or recording servers.

If you install the LPR server on a different computer, you must add the **Windows user** to the **Administrators** role in XProtect.

Start installation

1. On the download page of the Milestone website (https://www.milestonesys.com/download/), download the two installers:
   - Milestone XProtect LPR Plug-in Installer to all computers that run the Management Client and the event server
   - Milestone XProtect LPR Server Installer to all computers allocated for this purpose. You can also create virtual servers for LPR on one computer
2. First, run all the *Milestone XProtect LPR Plug-in* installers.

3. Then, run the *Milestone XProtect LPR Server* installer(s).

   During installation:

   1. Specify the IP address or host name of the management server or image server including the domain user name and password of a user account that has administrator rights to the surveillance system.
   2. For secure communication:
      - Select the certificate used to connect to the management server
      - Select the certificate used to connect to the event server

      For more information, see the certificates guide about how to secure your XProtect VMS installations.
   3. Select the service account. If the computer is part of a domain, the service must run as either a predefined Network Service or a domain user account.

4. Launch the Management Client.

   In the **Site Navigation pane**, your Management Client automatically lists the installed LPR servers in the **LPR Servers** list.

5. Make sure that you have the necessary licenses (see XProtect LPR licenses on page 10).

6. All country modules are automatically installed when you install your XProtect LPR product. However, the installed modules are by default disabled and you must enable the modules (see Country modules tab) that you want to use. You can only enable as many country modules as you have LPR country module licenses for.

You cannot add LPR servers from the Management Client.

If you need to install more LPR servers after the initial installation, run the *Milestone XProtect LPR Server* Installer on these computers.

> If an antivirus program is installed on a computer running XProtect software, it is important that you exclude the `C:\ProgramData\Milestone\XProtect LPR` folder. Without implementing this exception, virus scanning uses a considerable amount of system resources and the scanning process can temporarily lock files.

Configuration

View LPR server information

To check the state of your LPR servers:

1. In the **Site Navigation pane** > **Servers**, select **LPR servers**.

   In the **LPR server information** window, see an overview of all installed LPR servers and their name, host name, and status.

2. Select an LPR server.

   In the **LPR server information** window, see details about the server.

LPR server information properties

Field	Description
Name	Here you can change the name of the LPR server.
Host name	Shows the LPR server host name. The first part of the name of the LPR server consists of the name of the host computer for your LPR server installation. Example: `MYHOST.domainname.country`.
Status	Shows the status of the LPR server. If the server has just been added, the status is: • No LPR cameras configured If the system is running without problems, the status is: • All LPR cameras are running Alternatively, the system returns: • Service not responding • Not connected to surveillance system • Service not running • Event Server not connected • Unknown error

Field	Description
	• X of Y LPR cameras running
Service up time	Shows the up time since the LPR server was last down and the LPR Server service started.
Computer CPU usage	Shows the current CPU usage on the entire computer with the LPR server(s) installed.
Memory available	Shows how much memory is available on the LPR server.
Recognized license plates	Shows the number of license plates that the LPR server has recognized in this session.
LPR cameras	Shows a list of enabled LPR cameras that run on the LPR server and their status.
LPR cameras available	Based on your license, this number shows how many additional LPR cameras you are allowed to add and use on all your LPR servers in total.
Country modules available	Based on your license, this number shows how many additional country modules you are allowed to use on all your LPR servers in total. It also lists the number of country modules already in use.

Configuring cameras for LPR

This article describes the steps to go through when you add and configure cameras used with XProtect LPR.

Requirements for LPR in the Management Client

When you've mounted the cameras and added them in the Management Client, adjust each camera's settings so that they match the requirements for LPR. You can adjust camera settings on the properties tabs for each camera device.

For the relevant cameras, Milestone recommends to:

- Set the video codec to H.264

  > For LPR use, JPEG is not recommended and H.265 is not supported. Disadvantages of using other codecs include delays in stream processing and unnecessary extra CPU load on the server. For this reason, Milestone recommends that you always use H.264 video streams for LPR cameras.

- Specify a frame rate of four frames per second.
- Avoid compression, so set a fine quality.
- If possible, specify a resolution below one megapixel.
- If possible, keep automatic sharpness at a low level.

Snapshots

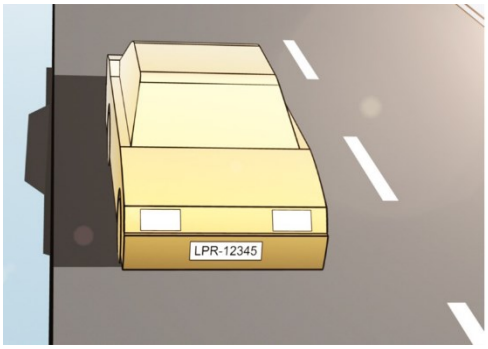
XProtect LPR uses snapshots to automatically fine-tune the camera setup and show how recognition settings affect image results. To complete the initial setup, you need to provide at least one valid snapshot.

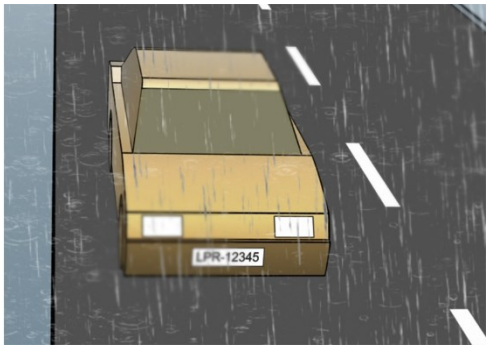
As a guideline, take the snapshots of vehicles in the actual environment and lighting conditions where you want license plates to be recognized.

The examples below show typical situations to consider when you capture and choose snapshots. Not all may apply to your setup.

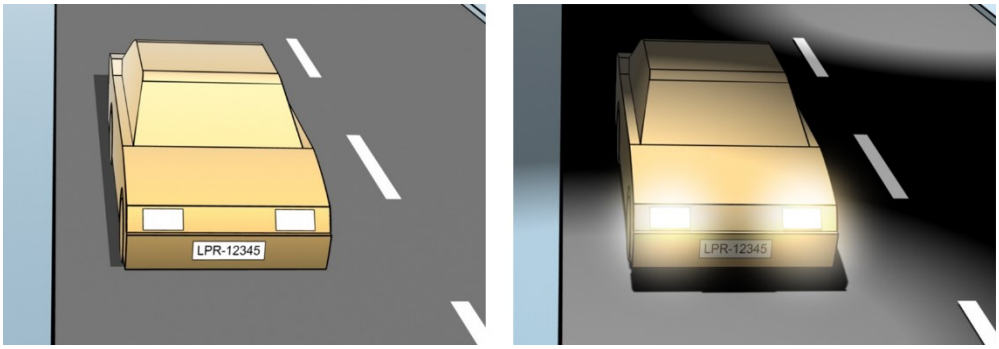
Milestone recommends that you select a minimum of 5-10 snapshots that represent typical conditions of:

The weather, such as sunlight and rain

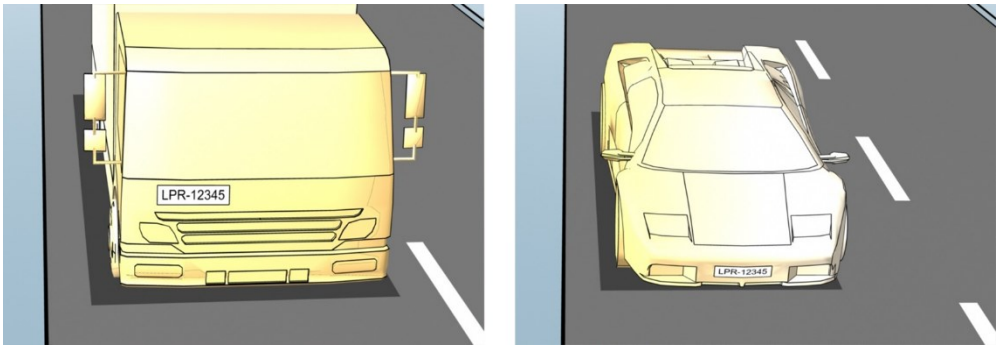




The light, such as daylight and nighttime

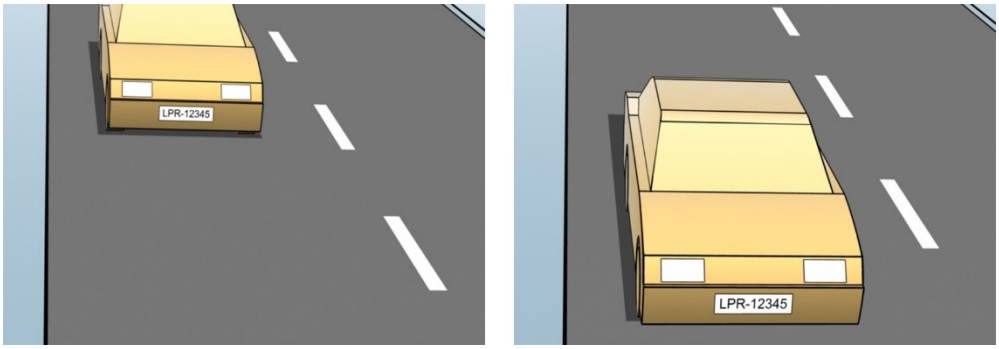


Vehicle types to define the top and bottom of the recognition area



Position in the lane to define the left and right of the recognition area

Distance to the car to define the area where LPR analyzes license plates



Add a camera dedicated to LPR

To set up cameras for license plate recognition, you must run the **Add LPR camera** wizard. It guides you through the main configuration steps and automatically adjusts settings to improve recognition performance.

To run the wizard:

1. In the **Site Navigation** pane, select **Servers** > **LPR servers** > **LPR cameras**.
2. Right-click the server and select **Add LPR camera**.
3. Follow the instructions in the wizard:
    - Select the camera you want to configure for LPR.
    - Select which country modules you want to use with your LPR camera.
    - Select snapshots to use for validating the configuration).
    - Validate the result of the snapshot analysis.
    - Select the match lists to use. Use the default selection, if you have not yet created any lists.
4. On the last page, click **Close**. The camera used for license plate recognition is displayed in the Management Client. The system has optimizes the recognition settings as a result of your selections.
5. Select the camera you have added and review its settings. If needed, you can go back and adjust the settings to improve license plate recognition.
6. In the **Recognition settings** tab, click **Validate configuration**.

Adjust settings for your LPR camera

The system optimizes the camera's configuration automatically when you add it using the **Add LPR Camera** wizard. If you want to make changes to the initial configuration, you can:

- Change the name of the server or change server.
- Adjust and validate the recognition settings.
- Add more match lists.
- Enable additional country modules.

Info tab

This tab provides information about the selected camera:

Name	Description
Enable	LPR cameras are enabled by default after initial setup. You can disable any camera that isn't used for license plate recognition. Disabling an LPR camera affects only its use for LPR—it doesn't affect other recording activities.
Camera	Shows the name of the selected camera as it is displayed in the XProtect Management Client and the clients.
Description	Use this field to enter a description (optional).
Change Server	Click to change LPR server. Changing the LPR server can be a good idea if you need to load balance. For example, if the CPU load is too high on an LPR server, Milestone recommends that you move one or more LPR cameras to a different LPR server.

Recognition settings tab

When you are setting up XProtect LPR, the system auto-configures the recognition settings using your snapshots. You can change the settings but be aware that manual adjustments can significantly impact the recognition performance.

Action buttons

Change, update, and validate auto-configured settings.

Name	Description
Validate configuration	Test that license plates are recognized as expected.
Auto-configure	Discard manual changes and auto-configure settings.
Snapshots	Add or delete snapshots.

Recognition area

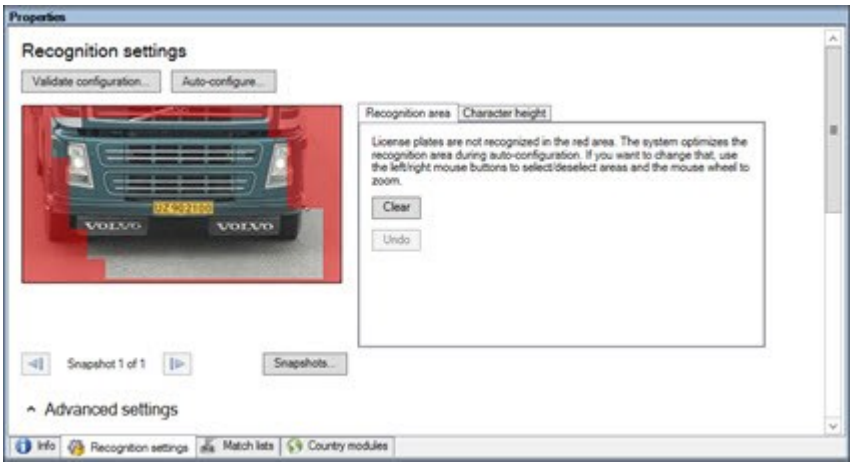
The recognition area defines which part of the image the system uses to detect license plates. How you set it up depends on your use case.

- Detecting license plates only: If your goal is strictly license plate recognition, define a smaller, clearly framed area that includes only where the plate is visible—ideally throughout the vehicle's movement in and out of the image.

  Milestone recommends selecting a clearly defined, well-positioned recognition area for the best results and to avoid false recognitions. Setting up a larger recognition area allows the system to analyze the entire vehicle body, which improves detection of visual features.

- Detecting vehicle properties: If you want to detect vehicle properties in addition to detecting the license plate, such as make, model, or color, adjust the recognition area to cover the entire part of the image where the vehicle will appear.

The red area shown in the image below shows the areas of the camera image that are excluded from the recognition area.



When defining the recognition area, you can click:

- **Clear** to remove all selections and define a new area.
- **Undo** to revert to your last saved selection.

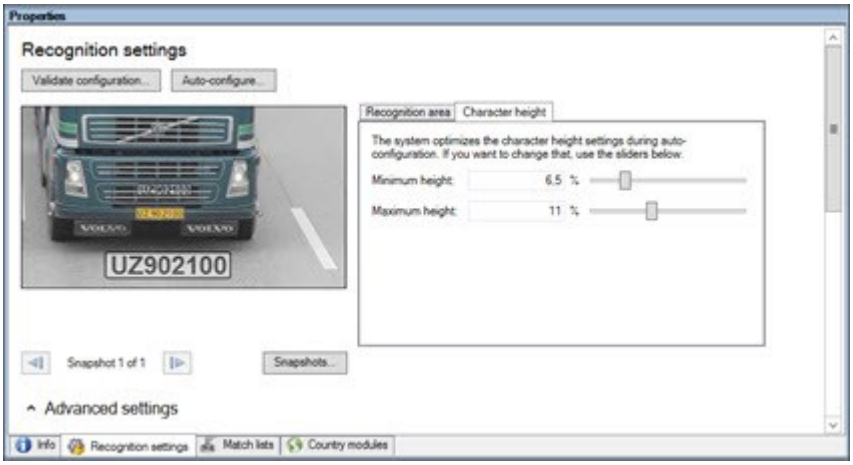
After changing your LPR camera settings, click **Validate configuration** to check if license plates are recognized as expected.

Character height

Set the minimum and maximum character height (in percent) to match the real height of the license plate characters as closely as possible.

These character settings affect the recognition time and process. The smaller the difference between the minimum and the maximum character height:

- The smoother the LPR process.
- The lower the CPU load.
- The sooner you get the results.



The overlay in the snapshot shows the current character height setting.

To compare it with the real license plate, drag the overlay over the license plate in the image. The overlay resizes when you adjust the character height settings on the right. Use your mouse wheel to zoom in for a closer view.

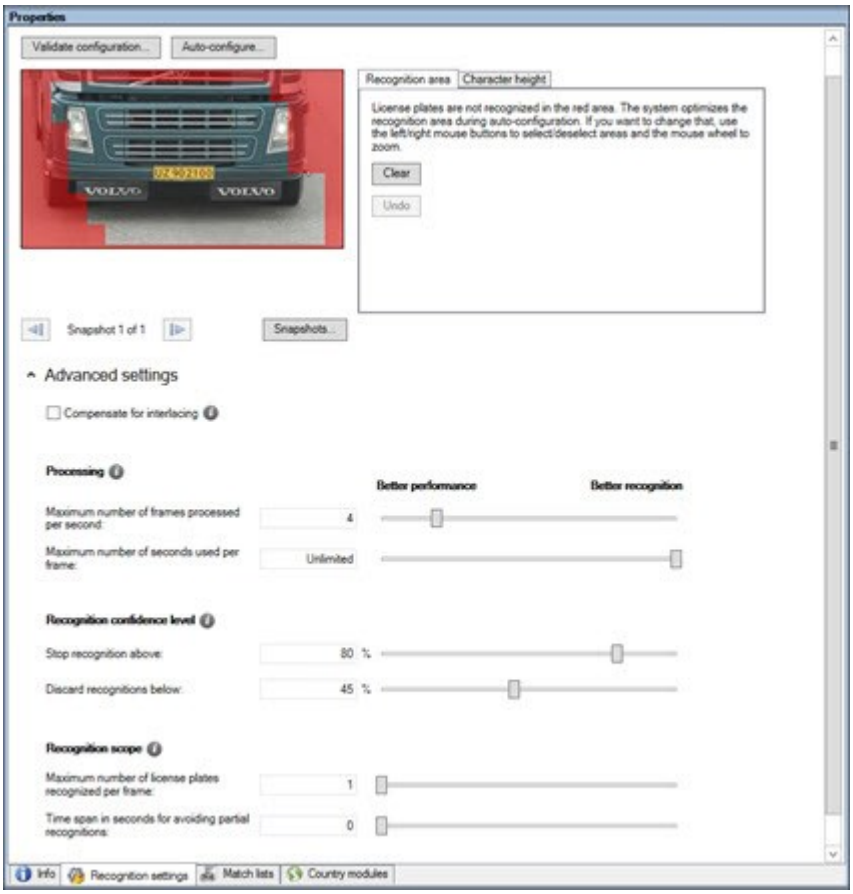
Name	Description
Minimum height	Set the minimum character height for including license plates in the recognition process. If the real license plate characters are smaller than the value you specify, the system will not start the recognition process.
Maximum height	Set the maximum character height for including license plates in the recognition process. If the real license plate characters are bigger than the value you specify, the system will not start the recognition process.

After changing the settings for your LPR camera, validate your configuration to check if the system recognizes license plates as well as expected.

Advanced settings

A license plate recognition process has two steps: detecting the license plate and reading the characters on it. Click **Advanced settings** to configure the parameters between processing speed and recognition quality.

High recognition quality	Processing speed
• More accurate plate and character recognition.	• Returns recognition results faster.
• Requires more computational power.	• Uses less computational power.
• Increases CPU load.	• Reduces CPU load.
• Takes longer to return results.	• May lower recognition accuracy.



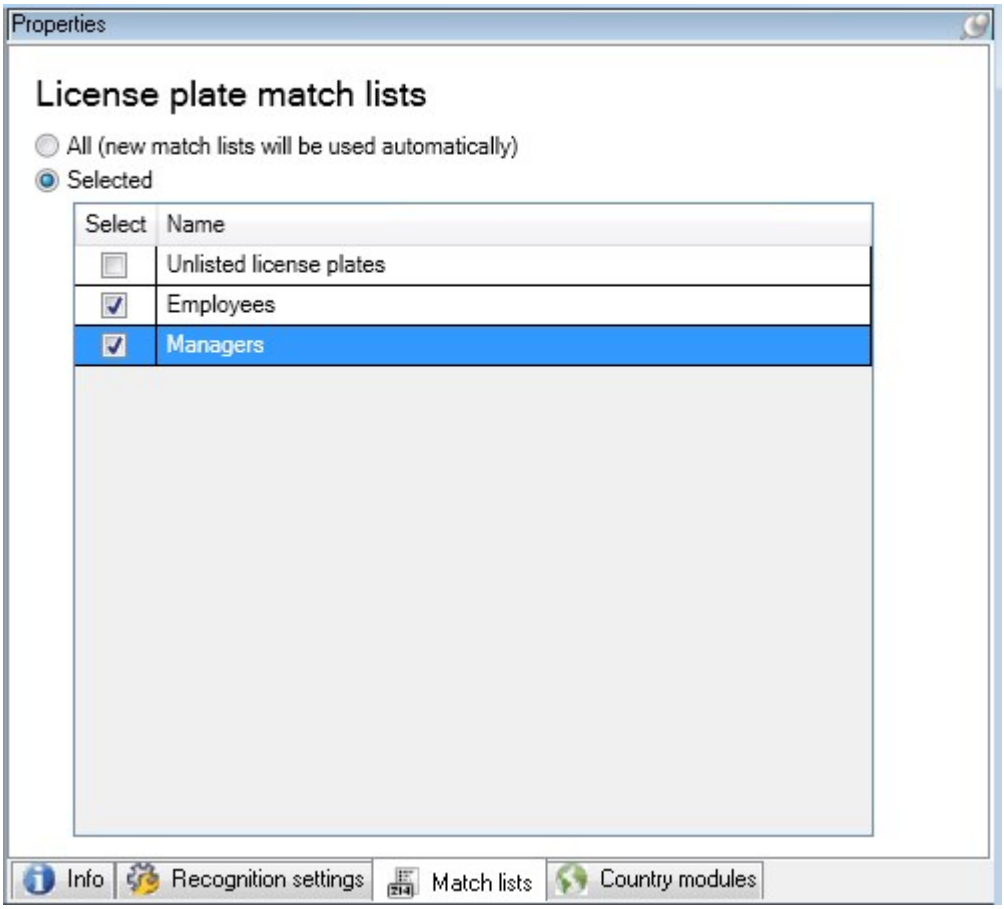
When the optimal results are met, the recognition process stops and returns the license plate it recognized at that point.

Name	Description
Compensate for interlacing	If your LPR camera records interlaced video, and you see a combing effect in the de-interlaced image in LPR, select this check box. This might improve the image quality and recognition results.
Maximum number of frames processed per second	Limit the number of frames your system processes every second. If you keep this setting low, you can increase the frame rate on your camera without adding unnecessary load to your LPR server. **Unrestricted**: Remove the top limit. You will risk increasing the processing time and the CPU load.
Maximum number of seconds used per frame	Limit the number of seconds your LPR can spend on recognizing one frame. If adjusted, the recommended value is 0.2 seconds per frame. **Unlimited**: Remove the top limit. You will risk increasing the processing time and the CPU load.
Stop recognition above	Stop recognition when a license plate is recognized with a confidence level equal to or above the value you specify.
Discard recognitions below	Discard recognitions with a confidence level below the value you specify. Increase this value to get fewer but possibly more accurate recognitions. Decrease this value to get more but potentially less accurate recognitions. The smaller the difference between **Stop recognition above** and **Discard recognitions below** values, the lower the processing time and the CPU load.
Maximum number of license plates recognized per frame	Recognize several license plates simultaneously. For example, relevant for cameras recording multi-lane roads, where many license plates must be recognized at the same time. **Unrestricted**: Remove the top limit. You will risk increasing the processing time and the CPU load.
Time span in seconds for avoiding partial recognitions	Delay all recognitions for the time period you specify. This is to avoid that the same license plate is recognized several times as different license plates. The system will wait for a better recognition and only accept the most complete recognition.  Before changing this setting, ensure no irrelevant moving objects block the view of your LPR camera.

After changing the settings for your LPR camera, validate your configuration to check if the system recognizes license plates as well as expected.

Match lists tab

On this tab, select which match list(s) you want a specific LPR camera to match license plates against. You can create as many lists as you need (see Add new match lists).



Name	Description
All	License plates are matched against all available and future lists.
Selected	License plates are matched against the selected lists only. Select one or more from the available lists.

After changing the settings for your LPR camera, validate your configuration (see Validate configuration on page 50) to check if the system recognizes license plates as well as expected.

Country modules tab

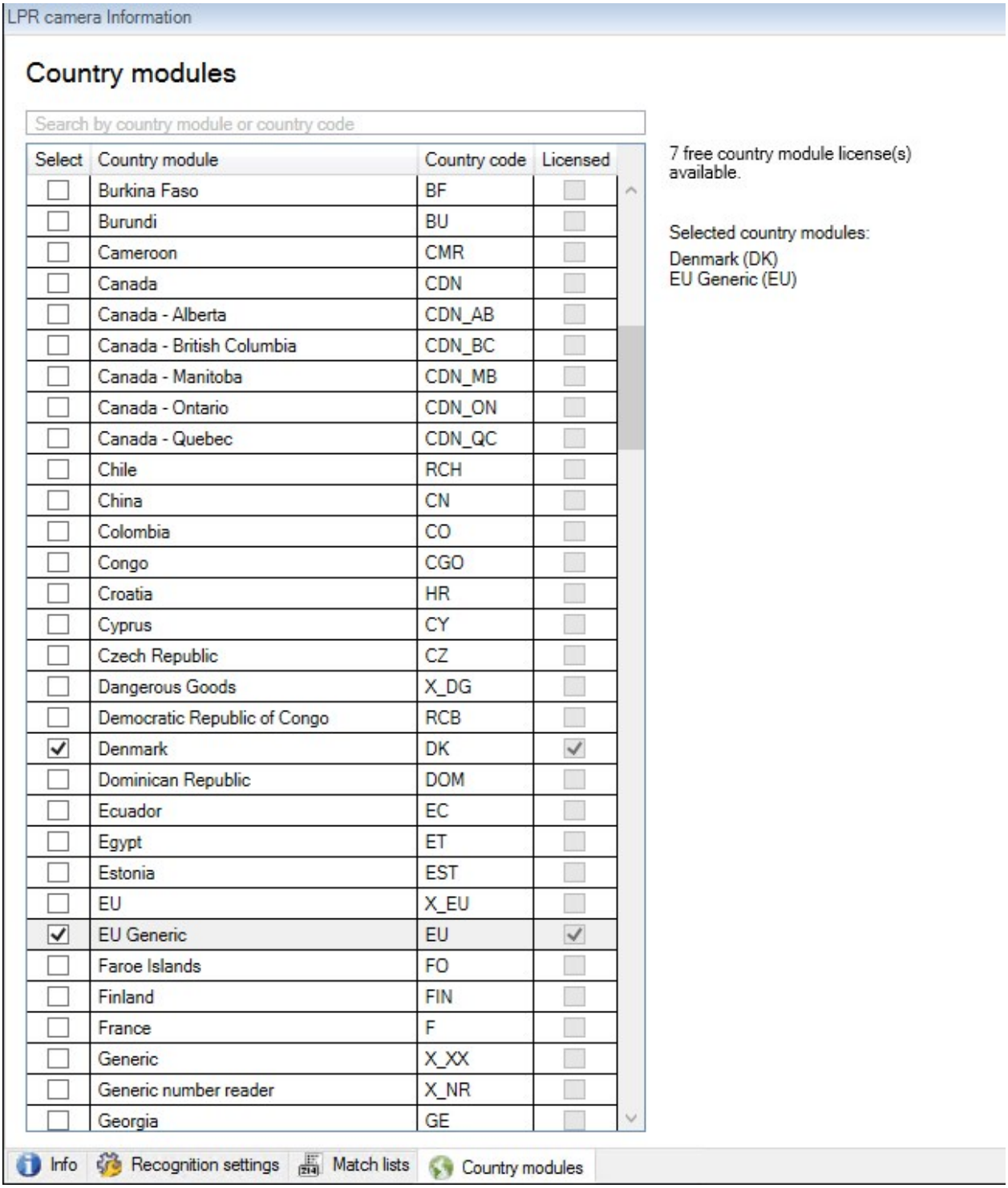
A country module tells the system how to recognize which license plates come from which countries, states, or regions—based on how the plates look and are structured.

On this tab, select the country modules that you want to use with a specific LPR camera. The list that you can select from depends on:

- The modules that you have installed.
- Your licenses.

Milestone recommends that you add a maximum of five (5) country modules per camera.

Modules that are already licensed show a check mark in the **Licensed** column. If you don’t see the country module you need, contact your vendor.


LPR camera Information
Country modules
Search by country module or country code
Select
Country module
Country code
Licensed
Burkina Faso BF
Burundi BU
Cameroon CMR
Canada CDN
Canada - Alberta CDN_AB
Canada - British Columbia CDN_BC
Canada - Manitoba CDN_MB
Canada - Ontario CDN_ON
Canada - Quebec CDN_QC
Chile RCH
China CN
Colombia CO
Congo CGO
Croatia HR
Cyprus CY
Czech Republic CZ
Dangerous Goods X_DG
Democratic Republic of Congo RCB
Denmark DK
Dominican Republic DOM
Ecuador EC
Egypt ET
Estonia EST
EU X_EU
EU Generic EU
Faroe Islands FO
Finland FIN
France F
Generic X_XX
Generic number reader X_NR
Georgia GE
7 free country module license(s) available.
Selected country modules:
Denmark (DK)
EU Generic (EU)
Info
Recognition settings
Match lists
Country modules

Name	Description
Select	Click to select or deselect a country module. The list of selected country modules on the right-hand side updates automatically.
Country Module	Lists the installed country modules.
Country Code	Letters that identify a country module.
Licensed	Shows if a country module is already licensed. You can select a licensed country module for as many cameras as you like.

After changing the settings for your LPR camera, validate your configuration (see Validate configuration on page 50) to check if the system recognizes license plates as well as expected.

Avoid partial recognitions by extending the time span

If parts of the same license plate are being detected as separate, incomplete numbers, first make sure nothing is briefly blocking the camera view—like moving objects or glare.

If the issue continues, you can give the system more time to capture a complete plate. This adjustment can improve the accuracy in detections, but it may delay the recognition results slightly.

To adjust the time span:

1. In the **Site Navigation** pane, select **Servers** > **LPR servers** > **LPR cameras**.
2. In the **LPR cameras** pane, select the camera you want to modify.
3. On the **Recognition settings** tab, click **Advanced settings**.
4. In the **Time span for avoiding partial recognitions** field, drag the slider to the right. You can give the system up to five (5) extra seconds to capture the best result and ignore partial reads.

Select snapshots

You added snapshots during the initial setup in the **Add LPR camera** wizard that helped set up the recognition accuracy. You can add more snapshots anytime to improve the recognition accuracy.

Follow these steps to add and validate snapshots:

1. Select the relevant camera and go to the **Recognition settings** tab. Click **Snapshots**.
2. Take snapshots from live video or import them from an external source. Click **Next**.The system analyzes the snapshots for the selected camera.
3. On the next page, review the snapshots. Approve or reject each one.
    - If no license plates were recognized, click **Previous** and add higher-quality snapshots.
    - If recognition still fails, check your camera's mounting and configuration settings.
4. When all snapshots are approved, click **Next** and close the wizard.
5. Return to the **Recognition settings** tab, then click **Validate configuration**.

Validate configuration

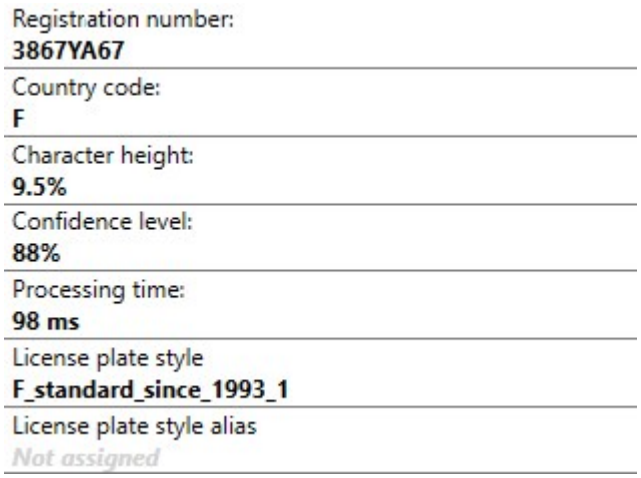
You can validate your current configuration to check if any settings need adjusting or if more snapshots are needed. Validation shows how many license plates the system recognizes and whether they're recognized correctly.

This helps you determine whether the confidence level is appropriate and if the system is set up correctly.

1. Select the relevant camera.
2. On the **Recognition settings** tab, click **Validate configuration**.

   The system analyzes the current snapshots and displays a summary of results based on your configuration:

   - **Registration number**: Detected license plate number.
   - **Country code**: Letters identifying the country module.
   - **Character height**: Character size in the image, shown as a percentage.
   - **Confidence level**: The system's confidence in the recognition result.
   - **Processing time**: Time taken to analyze each snapshot (in milliseconds).
   - **License plate style**: The format or pattern detected. See License plate styles and aliases.
   - **License plate style alias**: A more user-friendly name for the license plate style. See Aliases.



3. If the configuration looks good, click **Close**.
4. To investigate further, click **Next** and review individual snapshot results to help you pinpoint where recognition is failing.

You can validate the configuration as often as you need to, on any LPR camera, and with different settings.

Auto-configure

If you select automatic configuration (auto-configure), any manual changes you've made will be overwritten. Choose this option if your manual configuration hasn't led to consistently useful recognition results.

1. From the **Recognition settings** tab, click **Auto-configure**. A new window is displayed.
2. Confirm that you want to return to auto-configured settings by clicking **Next**. The system optimizes the

settings.

3. Click **Close**, then save the configuration.
4. Review and validate (see Validate configuration) the new settings.

Match lists

A match list is a set of license plate numbers, aliases, and/or vehicle properties the system can check for. When a captured license plate matches one on the match list, it can trigger actions like alerts, gate access, or law enforcement notifications. Match lists are used for cases such as security, parking control, tolling, and tracking vehicles of interest.

You can add the following matching criteria to match lists:

- A license plate registration number, such as ABC 1234??
- Alias, such as DK_PRIVATE. Only system administrators can add aliases.
- Make, such as Toyota
- Model, such as Corolla
- Type, such as Car
- Color, such as Blue
- Side, such as Front.

Each license plate recognition belongs to a match list. The default one is the Unlisted license plate. You can create custom match lists with different criteria depending on your need.

License plate recognitions are compared with the match lists. If there is a match, the system triggers a match list event. Match list events are stored on the event server. Operators can search for and view match list events on the **LPR** tab in XProtect Smart Client. By default, match lists events are stored for 90 days. You can change the settings if you need to. See Change the retention time for match lists and LPR server events on page 57.

For each match list you create, you can define rules and alarms that trigger a match list event when there is a match.

Examples:

- A company headquarter uses a list of executive management's company car license plates to grant executives access to a separate parking area. When executives' license plates are recognized, the system triggers an output signal that opens the gate to the parking area.
- A chain of gas stations creates a list of license plates from vehicles that have previously left gas stations without paying for their gas. When such license plates are recognized, the system triggers output signals that activate an alarm and temporarily block the gas supply to certain gas pumps.

You can also use triggered events to force cameras to record in high quality or similar. You can even use an event to trigger combinations of such actions.

Associating match lists with LPR cameras

By default, all match lists are listed to all LPR cameras. But if you need to, you can associate certain LPR cameras and match lists if you need only specific LPR cameras to handle specific match lists.

You can make that association by going to **LPR servers** > **LPR cameras**, then you choose the relevant LPR camera and go to the **Match list** tab to select the match lists to associate with the particular camera.

Unlisted license plates list

Often you trigger an event when a license plate that is included in a match list is recognized, but you can also trigger an event with a license plate which is **not** included in a match list.

Example: A private car park uses a list of license plates to grant residents' vehicles access to the car park. If a vehicle with a license plate that is not in the list approaches the car park, the LPR solution triggers an output signal which lights a sign telling the driver to obtain a temporary guest pass from the security office.

To trigger a surveillance system event when a license plate that is **not** on any of your match lists is recognized, use the **Unlisted license plates** list. You select it for a camera like any other list (see Match lists tab) and set it up like any other list (see Events triggered by LPR on page 62).

Add new match lists

1. In the **Site Navigation pane**, select **Match lists**, right-click and select **Add New**.
2. In the window that appears, give the list a name and click **OK**.

   The newly created match list now appears in the **Match lists** window and on the **Match lists** tab of every LPR camera.
3. To add columns to the match list, click **Custom field** and specify the columns in the window that opens (see Edit custom fields properties on page 56). You can add a maximum of five (5) columns.
4. To update the match list, use the **Add** or **Delete** buttons (see Add match list items on page 53).
5. Confirm your changes to save.

Instead of defining the match list directly in the Management Client, you can instead import a file (see Import and export match lists on page 54).

You can only edit the properties of custom fields.

Add match list items

Match lists support registration numbers, aliases and vehicle properties, but not individual license plate styles. If you want to include a specific license plate style in a match list, first create an alias for it. Then, add that alias to the list. See Assign alias to license plate styles.

1. In the **Site Navigation pane** > **Servers**, select **Match lists**.
2. Go to the Overview pane. Select the relevant match list.
3. The **Match list information** window opens.
4. To include new rows to your list, click **Add** and fill out the fields.
    - Do not include any spaces.
    - Always use capital letters.

      Examples: *ABC123* (correct), *ABC 123* (incorrect), *abc123* (incorrect)
    - You can use wildcards in your match lists by defining plates with a number of ?'s and the letter(s) and/or number(s) which must appear at specific places.

      Examples: *?????A*, *A?????*, *???1??*, *22??33*, *A?B?C?* or similar
5. Confirm your changes to save.

Import and export match lists

You can only import and export license plate registration numbers. Other vehicle information supported by match lists, for example aliases, cannot be imported or exported.

You can import a .csv or a .txt file with a list of license plate registration numbers that you want to use in a match list. You have the following import options:

- Add license plate registration numbers to the existing match list.
- Replace the existing match list.

This is useful if, for example, the match lists are managed from a central location. Then all local installations can be updated by distributing a file. Imports of a match list overwrites the current match list.

Similarly, you can export the complete list of license plate registration numbers from a match list to an external location.

To import:

1. In the **Site Navigation pane** > **Servers** > **Match lists**, select the relevant match list.
2. Select **Import**.
3. In the window, specify the location of the import file and the import type. Select **Next**.
4. Await the confirmation and select **Close**.

To export:

1. In the **Site Navigation pane** > **Servers** > **Match lists**, select the relevant match list.
2. Select **Export**.
3. In the window, specify the location of the export file and select **Next**.
4. Select **Close**.
5. You can open and edit the exported file in, for example, Microsoft Excel.

Exports only include registration numbers and not aliases.

Match list properties

Name	Description
List name	Shows the name of the list. If needed, you can change the name.
Custom fields	Select to specify which license plate entry columns that you or the client user can add additional information to. See Add match list items on page 53.
Search	Search the match list for any list item. If needed, you can use *?* as a single wildcard
Add	Select to add a license plate registration number or an alias to the match list. When you're adding license plate registration numbers: • Do not include any spaces • Always use capital letters **Examples**: *ABC123* (correct), *ABC 123* (incorrect), *abc123* (incorrect) • You can use wildcards in your license plate lists. Do this by defining plates with a number of ?'s and the letter(s) and/or number(s) which must appear at specific places **Examples**: *?????A*, *A?????*, *???1??*, *22??33*, *A?B?C?* and similar. Some regional areas might have exceptions to these rules. For example, personalized plates with spaces. Plates with two sets of characters which must be recognized separately by an underscore character (_). Or plates from certain regions with letters on a different background color on parts of the license plate. **Example**: 

Name	Description
Edit	Make edits to properties of custom fields.
Delete	Click to delete the selected license plate number.
Import	Click to import license plate registration numbers from any comma-separated file, for example a .txt-file or .csv-file (see Import and export match lists on page 54).
Export	Click to export the list of license plate registration numbers to a comma-separated file, for example a .txt-file or .csv-file.
Rows per page	Select how many list items to display in one page (one screen). You can choose between 50 and 1000 rows.
Events triggered by list match	Select which event(s) should be triggered by a list match. You can choose between all available types of events defined in your system.

Edit custom fields properties

You can add a maximum of five (5) columns to your match lists for additional information. You can define the name and number of columns, and the content of the fields.

XProtect Smart Client users can update the information in the columns but not the columns themselves.

Name	Description
Add	Adds a column to the match list. Enter a name for the column.
Edit	Click to edit the name of the column.
Delete	Deletes a column.
Up	Changes the order of the columns.
Down	Changes the order of the columns.

Change the retention time for match lists and LPR server events

By default, match list events are stored for 90 days. To change the event retention time:

1. In the Management Client, select **Tools** > **Options** > **Alarms and events**.
2. Under **Event retention** > **Match list**, change the retention time in the **Retention time (days)** column.

License plate styles and aliases

License plate styles and aliases help you standardize and simplify how the system understands and interprets license plate data.

- License plate styles define how plate numbers are displayed or grouped based on region, format, or use case. Applying consistent license plate styles helps improve the readability, search accuracy, and system consistency, especially when you work across different regions or formats.
- Aliases enable you to assign a readable name to a license plate. Instead of tracking a number like `ABC123`, you can label it as Maintenance Van or Visitor – Jane Doe, making it easier to understand and manage entries.

These tools make it easier for you to search, identify, and respond to relevant vehicles in the system.

License plate styles

A license plate style is a set of characteristics of a license plate. These characteristics include:

- The plate size and shape
- The text format and font
- The colors
- The type of vehicle that the license plate is used on.

See a list of all license plate styles supported by XProtect LPR.

You can group license plate styles into aliases. See Aliases on page 57.

Aliases

A license plate style alias (alias) is a group of license plate styles. You can group license plate styles into an alias by creating the alias and assigning the alias to the license plate styles of your choice.

You don't need to use aliases, but they could be useful for a number of reasons:

- Aliases help you categorize license plate styles according to your license plate recognition needs. See Example of use of aliases and license plate styles on page 58.
- License plate styles have long and complex names that might be difficult to work with. Using aliases,

you can give license plate styles a more descriptive group name.

- You can add aliases to match lists. See Edit match lists.
- The XProtect Smart Client operator can add aliases to match lists.

Find license plate styles used in your system

Every country module contains license plate styles. When you enable a country module, all the license plate styles that belong to that country module are also enabled.

To see a list of all license plate styles enabled in your system:

1. Select **Site Navigation** > **Servers** > **License plate style aliases** > **Assign aliases**.
2. In the **License plate style** column, see a list of all license plate styles enabled in your system.

Match lists support registration numbers, aliases and vehicle properties, but not individual license plate styles. If you want to include a specific license plate style in a match list, first create an alias for it. Then, add that alias to the list. See Assign alias to license plate styles. See Edit match lists.

Add, edit, delete aliases

1. Select **Site Navigation** > **Servers** > **License plate style aliases** > **Configure aliases**.
2. Select:
    - **Add** to create an alias and specify an alias name
    - **Edit** to rename an alias
    - **Delete** to remove an alias.

Group license plate styles into aliases

To group multiple license plate styles into one alias, assign an alias to the license plate styles.

1. Select **Site Navigation** > **Servers** > **License plate style aliases** > **Assign aliases**.
2. For each license plate style you want to assign an alias to:
    1. Select the drop-down list in the **Alias** column.
    2. Select the alias you need.

Example of use of aliases and license plate styles

In this example, let's create aliases and assign them to license plate styles in the Denmark country module.

To follow along, open the Management Client and enable the Denmark country module.

For our license plate recognition needs, we decide to categorize license plate styles in the Denmark country module into the following groups:

- Commercial
- Motorcycle
- Private
- Standard.

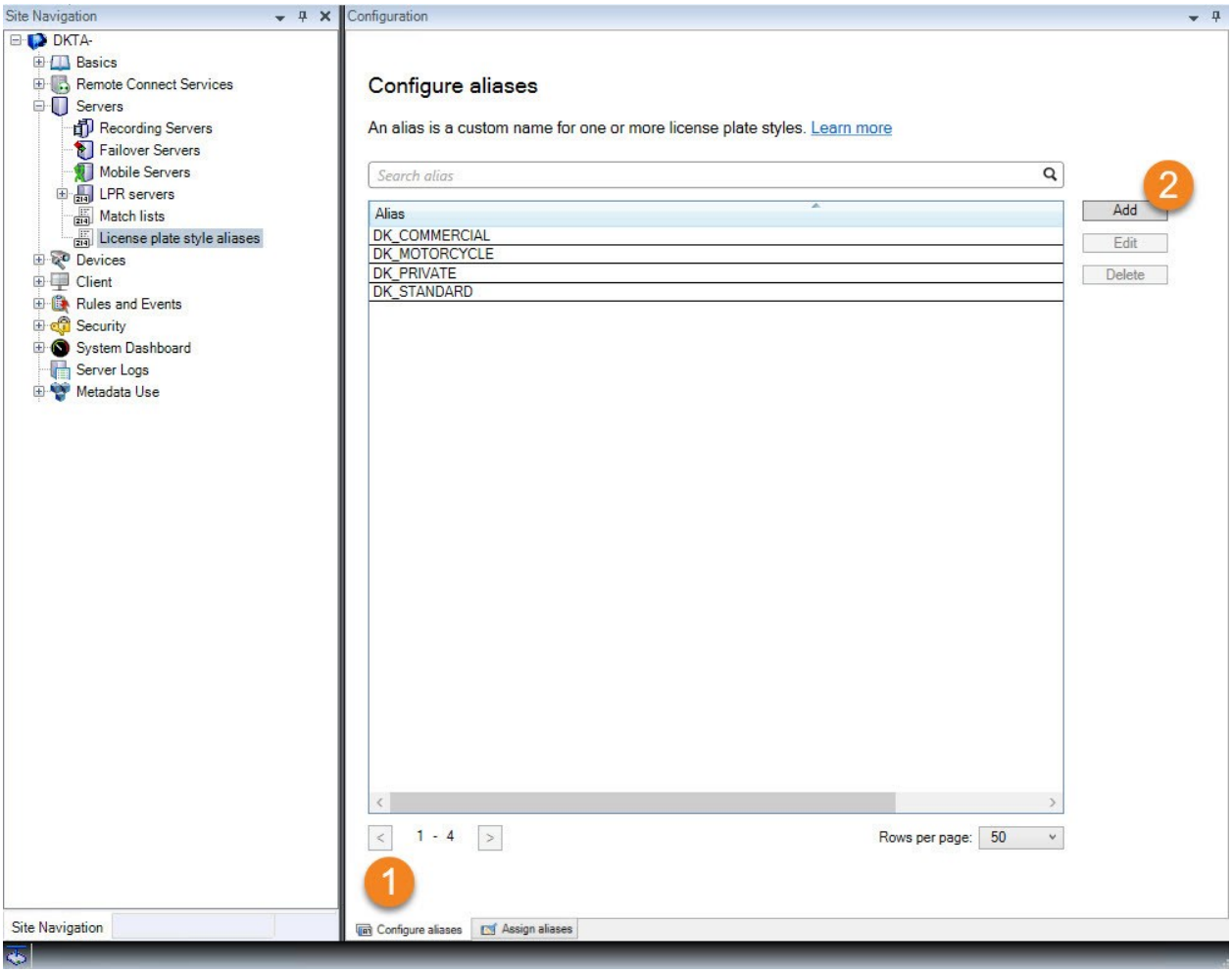
With the Denmark country module already enabled, let's first create the aliases, and then assign them to license plate styles.

Create aliases

1. Select **Site Navigation** > **Servers** > **License plate style aliases** > **Configure aliases**.
2. Select **Add** to create an alias.

   Let's create the four aliases:

   - **DK_COMMERCIAL**
   - **DK_MOTORCYCLE**
   - **DK_PRIVATE**
   - **DK_STANDARD**



Next, let's group license plate styles into aliases by assigning the new aliases to the license plate styles.

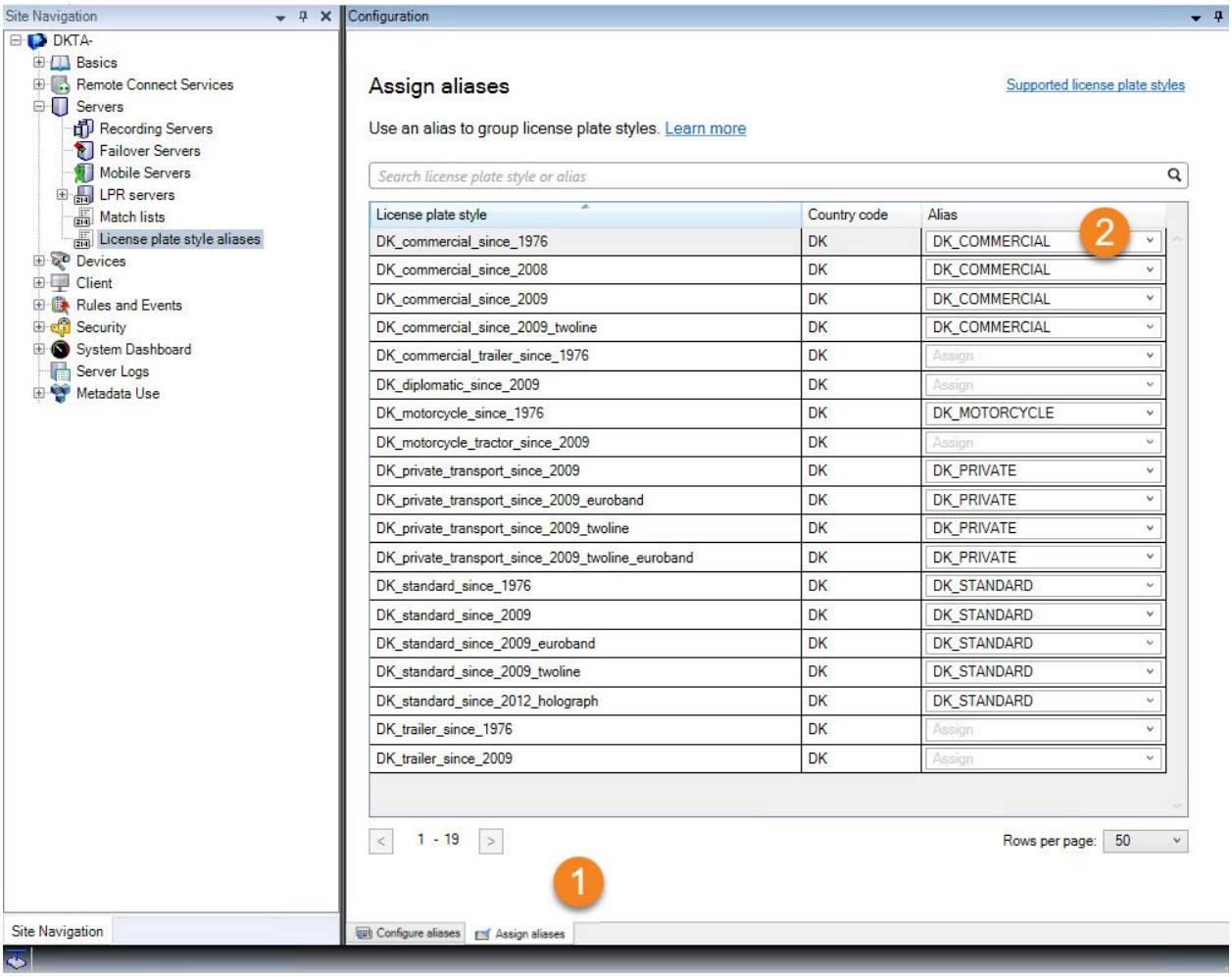
Assign the aliases to license plate styles

1. Select **Site Navigation** > **Servers** > **License plate style aliases** > **Assign aliases**.
2. For each license plate style that you want to assign an alias to, select the dropdown in the **Alias** column and select the alias of your choice.

   We assign aliases to license plate styles in the Denmark country module as follows:

License plate style	Alias
• **DK_commercial_since_1976**	**DK_COMMERCIAL**

License plate style	Alias
• DK_commercial_since_2008 • DK_commercial_since_2009 • DK_commercial_since_2009_twoline	
• DK_motorcycle_since_1976	DK_MOTORCYCLE
• DK_private_transport_since_2009 • DK_private_transport_since_2009_euroband • DK_private_transport_since_2009_twoline • DK_private_transport_since_2009_twoline_euroband	DK_PRIVATE
• DK_standard_since_1976 • DK_standard_since_2009 • DK_standard_since_2009_euroband • DK_standard_since_2009_twoline • DK_standard_since_2012_holograph	DK_STANDARD



Note that we assigned the **DK_MOTORCYCLE** alias to only one license plate style. We did that because we want to use this specific license plate style on a match list, and match lists support aliases but not individual license plate styles.

In this example, we created aliases and assigned them to license plate styles. A possible next step is to add the aliases to match lists. That way, we can associate different groups of license plate styles with different LPR events. For example, we can open a gate to a vehicle only if the license plate style of the vehicle is part of the **DK_COMMERCIAL** alias. See Match lists.

Events triggered by LPR

After you have created match lists, you can associate them with all types of events defined in your system.

The type of events available depends on the configuration of your system. In connection with LPR, events are used to trigger output signals for, for example, raising of parking barrier or making cameras record in high quality. You can also use an event to trigger combinations of such actions. See Match lists (explained) for more examples.

Set up system events triggered by list matches

1. In **Servers** > **Match list**, select the list to which you want to associate an event.
2. In the **Match list information** window, next to the **Events triggered by list match** selection field, click **Select**.
3. In the **Select triggered events** dialog box, select one or more events.
4. If prompted, confirm to save changes.
5. The event is now associated with recognitions on the selected match list.

To trigger a surveillance system event when a license plate that is **not** on a list is recognized, configure the **Unlisted license plates** list.

Alarms triggered by LPR

You can associate some types of alarms with events from XProtect LPR. Do the following:

1. Create the match list (see Add new match lists) you want to match license plates against.
2. Add and configure your LPR camera(s) (see Add LPR camera).
3. In the **Site Navigation pane** > **Alarms**, right-click **Alarm Definitions** and select **Add new** to create a new alarm.
4. The **Alarm definition information** window appears. Select the relevant properties (see Alarm definitions for LPR on page 63).
5. Save your changes.
6. Configure the alarm data settings for LPR (see Alarm data settings for LPR on page 64).

Alarm definitions for LPR

Except for defining **Triggering events**, the settings for **Alarm definitions** are the same for LPR as for the remaining part of the system.

To define triggering events related to LPR, select the event message to use when the alarm is triggered:

1. In the **Triggering event** field, in the top dropdown list, decide what type of event to use for the alarm. The list offers **Match lists** and **LPR server** events (see Working with match lists).
2. In the second dropdown list, select the specific event message to use. If you selected **Match lists** in the dropdown above, select a match list. If you selected **LPR server**, select the relevant LPR server event message:
    - LPR camera connection lost
    - LPR camera running
    - LPR server not responding
    - LPR server responding

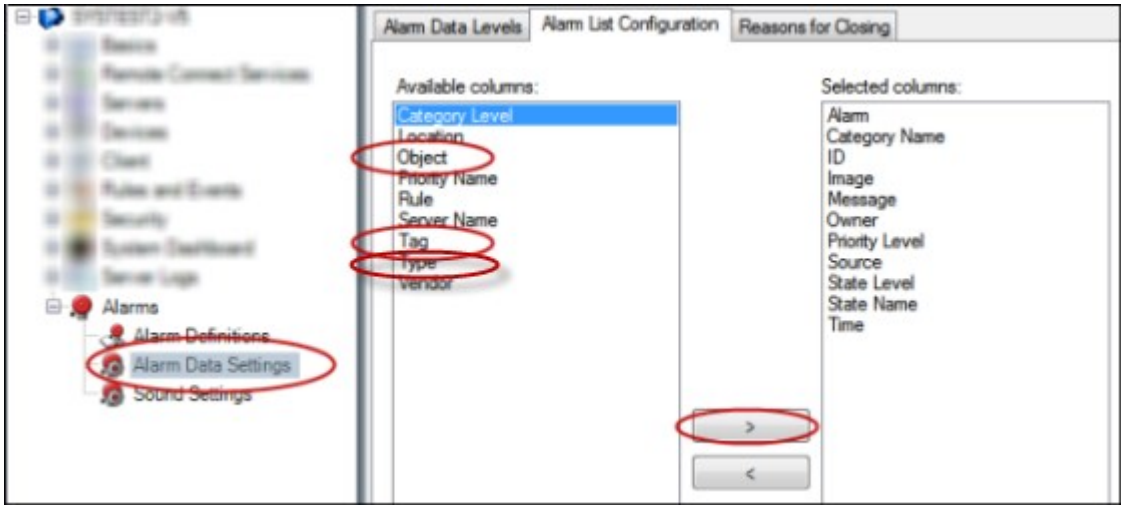
Alarm data settings for LPR

In the Management Client, you must make three specific **Alarm List Configuration** elements available for selection in XProtect Smart Client.

These elements are used for configuring alarm lists in the **Alarm Manager** tab in XProtect Smart Client. The relevant elements are **Object**, **Tag**, and **Type**, which are essential for recognizing license plate numbers (**Object**) and country codes (**Tag**).

Do the following in the Management Client:

1. In the **Site Navigation** > **Alarms**, select **Alarm Data Settings**.
2. On the **Alarm List Configuration** tab, select **Object**, **Tag**, and **Type** and click **>**.



3. Save your changes.

The XProtect Smart Client operator can now enable these LPR-specific elements on the **Alarm Manager** tab.

Maintenance

The LPR Server Manager

After installing an LPR server, you can check the status of its services with the XProtect LPR Server Manager. You can, for example, start and stop the LPR Server service, view status messages, and read log files.

- Access LPR server state information through the LPR Server Manager tray icon in the notification area of the computer running the LPR server.

In the Management Client, you can get a full overview of the status of your LPR servers. See View LPR server information.

Start and stop LPR Server service

The LPR Server service starts automatically after installation. If you have stopped the service manually, you can restart it manually.

1. Right-click the LPR Server Manager tray icon in the notification area.
2. From the menu that appears, select **Start LPR Server service**.
3. If needed, select **Stop LPR Server service** to stop the service again.

Show LPR server status

1. On your LPR server, right-click the LPR Server Manager tray icon in the notification area.
2. From the menu that appears, select **Show LPR server status**.

   If the system is running without problems, the status is: All LPR cameras running.

   Other statuses are:

   - Service not responding
   - Not connected to surveillance system
   - Service not running
   - Event Server not connected
   - Unknown error
   - X of Y LPR cameras running

Show LPR server log

Log files are a useful tool for monitoring and troubleshooting the status of the LPR Server service. All entries are time-stamped, with the most recent entries at the bottom.

1. In the notification area, right-click the LPR Server Manager icon.
2. From the menu that appears, select **Show LPR server Log File**.

   A log-viewer lists the server activities with time stamps.

Change LPR server settings

The LPR server must be able to communicate with your management server. To enable this, you specify the IP address or host name of the management server during the installation of the LPR server.

If you need to change the address of the management server, do the following:

1. Stop the LPR Server service.
2. In the notification area, right-click the LPR Server Manager icon.
3. From the menu that appears, select **Change settings**. The **LPR Server service settings** window appears.
4. Specify the new values and click **OK**.
5. Restart the LPR Server service.

Upgrade

Upgrade XProtect LPR

When upgrading, Milestone recommends that you first upgrade the LPR server and then XProtect LPR.

To upgrade XProtect LPR, follow the same steps as for installation. See Install XProtect LPR on page 34.

Uninstall XProtect LPR

If you want to remove XProtect LPR from your system, uninstall the two components separately using the regular Windows removal procedure:

- On the computers where the XProtect LPR plug-in is installed, uninstall *Milestone XProtect LPR [version] Plug-in*
- On the computers where the XProtect LPR server is installed, uninstall *Milestone XProtect LPR [version] Server*.

helpfeedback@milestone.dk

About Milestone

Milestone Systems is a leading provider of open platform video management software; technology that helps the world see how to ensure safety, protect assets and increase business efficiency. Milestone Systems enables an open platform community that drives collaboration and innovation in the development and use of network video technology, with reliable and scalable solutions that are proven in more than 150,000 sites worldwide. Founded in 1998, Milestone Systems is a stand-alone company in the Canon Group. For more information, visit https://www.milestonesys.com/.