Milestone Systems

XProtect® LPR 1.0

Administrator's Manual

milestone

The Open Platform Company

Contents

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Product overview

License plate recognition (LPR) is video-based content analysis (VCA) and recognition of vehicle license plates. To read the characters in question, LPR uses optical character recognition on images aided by specialized camera settings.

With XProtect LPR, Milestone provides an intelligent yet highly intuitive solution for interaction with your XProtect Corporate or XProtect Enterprise and your XProtect Smart Client. It lets you easily combine LPR with other XProtect surveillance features, such as recording, event-based activation of outputs, etc.

An event in XProtect LPR can, for example, trigger surveillance system recordings in a particular quality, match against positive/negative lists, open gates, switch on lights, push video of incidents to computer screens of particular members of security staff, send mobile phone text messages, and it can do this all at once.

XProtect LPR is therefore highly interesting in areas such as, transportation, industry and government, etc.

XProtect LPR also works in tight integration with solutions delivered by independent partners based on the Milestone Integration Platform (MIP). Note that such solutions may impact the performance of your XProtect Corporate or XProtect Enterprise.

This document is aimed at administrators and provides detailed descriptions of how to install and configure XProtect LPR.

This manual also covers XProtect Express, XProtect Professional and XProtect NVR. If you you are using XProtect LPR with one of these Milestone products, just replace all instances of XProtect Corporate or XProtect Enterprise with the name of your XProtect surveillance setup.

Minimum system requirements

Machine where the LPR Server is installed:

Operating System	Microsoft® Windows® XP Professional (32-bit or 64-bit*)
	Windows Server 2003 (32-bit or 64-bit*)
	Windows Server 2008 R1/R2 (32-bit or 64-bit*)
	Windows Server 2012
	Windows Vista™ Business (32-bit or 64-bit*)
	Windows Vista Enterprise (32-bit or 64-bit*)
	Windows Vista Ultimate (32-bit or 64-bit*)
	Windows 7 Professional (32-bit or 64-bit*)
	Windows 7 Enterprise (32-bit or 64-bit*)
	Windows 7 Ultimate (32-bit or 64-bit*)
	Windows 8 (32-bit or 64-bit*)
	* Running as a 32-bit application
CPU	Minimum Intel® Core™ 2, 2,4 GHz or higher.
RAM	Minimum 2 GB (4 GB or more recommended).
Network	Ethernet (1 Gbit recommended).
Graphics Adapter	AGP or PCI-Express, minimum 1024×768, 16 bit colors.
Hard Disk Type	E-IDE, PATA, SATA, SCSI, SAS (7200 RPM or faster).
Hard Disk Space	Minimum 80 GB free (depends on number of cameras and recording settings).
Software	Microsoft .Net 4.0 Framework.

Run the *Milestone XProtect LPR Server* installer on one or more machines especially allocated for the purpose. If preferred, you can use virtual machines for this purpose. You are recommended **not** to install the *Milestone XProtect LPR Server* on the same machine as your XProtect Management Server or Recording Server(s).

XProtect LPR must be installed with the latest version of XProtect Corporate or XProtect Enterprise **only**. That means XProtect Corporate 5.0b or newer or XProtect Enterprise 8.1a or newer. XProtect LPR requires XProtect Smart Client 7.0c or later versions.

LPR Licenses

For your XProtect LPR to run correctly, you must purchase the following LPR-related licenses:

   o   An **LPR Base License** which covers an unlimited number of LPR servers

o   An **LPR Camera License** per LPR camera

o   An **LPR License Plate Library license** for each country/region you need in your LPR setup (*one* License Plate Library license is included with the LPR Base License). To buy your LPR licenses, contact your vendor, or visit www.milestonesys.com to log into the software registration service center.

You can find the current status information on your licenses in the bottom part of the **LPR Server Information** window (see "View LPR server information" on page 11):

o   **LPR cameras available:** Based on your license, this shows how many remaining LPR cameras (devices) you are allowed to create and use on **all** your LPR servers in total.

o   **License Plate Libraries available:** Based on your license, this shows how many remaining License Plate Libraries you are allowed to use on **all** your LPR servers in total. It also indicates which License Plate Libraries are already in use on your **all** your LPR servers.

All License Plate Libraries are automatically installed when you install your XProtect LPR (see "Install XProtect LPR" on page 10). However, by default, all installed libraries are disabled and you must enable the libraries (see "Countries tab" on page 18) you want to use (considering any limitations in you license).

Example: You have a License Plate Library license covering five license plate libraries. You have installed 10 license plate libraries. Once you have selected five license plate libraries, you cannot select any more libraries. You must then clear some of your choices before you can select other libraries.

About XProtect LPR

Basic data flow of XProtect LPR:
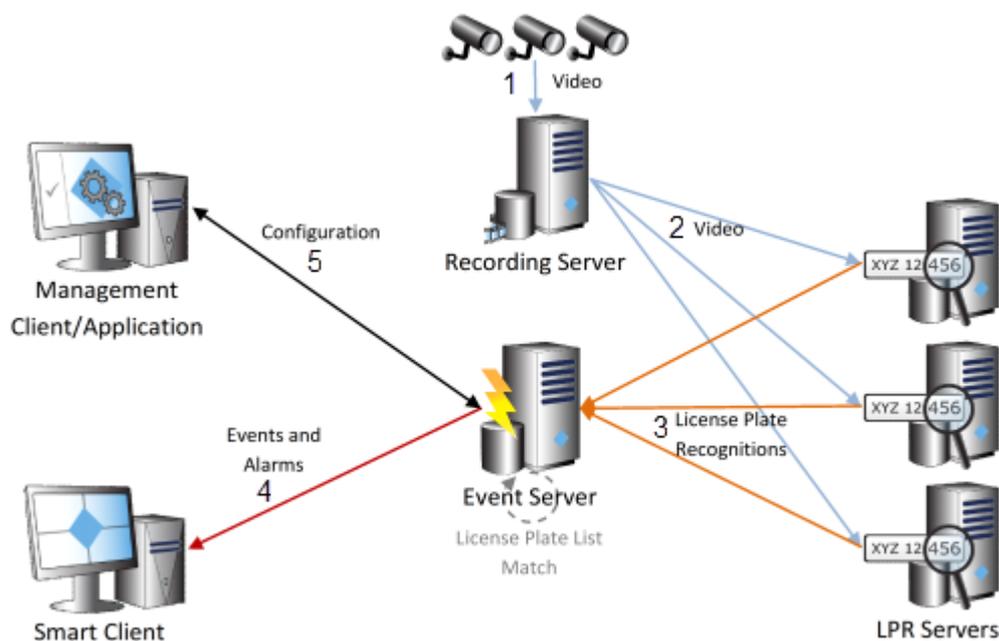
1. XProtect LPR camera(s) sends video to XProtect Recording Server(s).

2. XProtect Recording Server(s) sends video to XProtect LPR Server(s) to look for license plates.

3. XProtect LPR Server(s) sends recognitions to XProtect Event Server for matching with license plate lists.

4. XProtect Event Server sends events and alarms to XProtect Smart Client for viewing.

5. The entire LPR configuration (matching of lists, setting up of events and alarms, etc.) is handled from the XProtect Management Client or Managemement Application.

LPR FAQs

What does LPR stand for? License plate recognition.

What is LPR? LPR is video-based content analysis (VCA) and recognition of vehicle license plates. To read the characters in question, LPR uses optical character recognition on images aided by specialized camera settings.

What is an LPR Server? An LPR Server handles LPR video from XProtect Corporate or XProtect Enterprise. It turns this video into recognitions and sends these to the XProtect Event Server from where it can be used for events and alarms. An LPR Server should be installed on a machine especially allocated for the purpose.

What is an LPR camera? An LPR camera defines from where an LPR setup receives video (typically a camera), and how this video is configured and processed. An LPR setup typically has several LPR cameras. Each LPR camera requires an LPR Camera License.

What is a license plate library? A license plate library is a set of rules defining license plates of a certain type and form as belonging to a certain country or region. In other words, it dictates plate and character specifics (color, type, hight, spacing, and similar, which is used during the recognition process). Each license plate library requires an LPR License Plate Library license.

What is a license plate list? A license plate list is a list that you create. License plate lists are collections of license plates that you want your LPR solution to treat in a special way. Once you have specified a list, you can set up events to recognize license plates on these lists and in this way trigger your XProtect Corporate or XProtect Enterprise events. It is also possible to create alarms built/based on LPR events.

Compatibility

XProtect LPR is compatible with XProtect Corporate 5.0b or XProtect Enterprise 8.1a and forward.

You are recommended **not** to use XProtect LPR with older versions of XProtect Corporate or XProtect Enterprise.

It is also compatible with XProtect Express 1.1 and forward, XProtect Professional 8.1 and forward and XProtect NVR 2 and forward.

LPR requires XProtect Smart Client 7.0c or later versions.

Reimplement - do not upgrade

XProtect LPR 1.0 is a new product making use of new technologies such as the XProtect Event Server and Alarms. As a result, it is not possible to upgrade from former Milestone LPR solutions. Instead you must reimplement your solution.

Important prerequisites

Add cameras required for XProtect LPR: If you have not already added the cameras you are going to use with XProtect LPR, do so in XProtect Corporate or XProtect Enterprise before configuring XProtect LPR.

Adjust camera configuration for LPR: Once cameras are added, adjust each required camera's settings in XProtect Corporate or XProtect Enterprise so that the settings match the requirements for LPR. For the relevant cameras it is recommended to set:

- a frame rate of four frames per second

- a low compression

- if possible, a low sharpness value

- the video codec to JPEG

- resolution which is not too high.

Note that if you use H.264 codec instead of JPEG, only GOP-frames are supported (which is usually only 1 frame per second). For **higher frame-rates**, use **JPEG** codec.

Install XProtect LPR

The XProtect LPR software can be downloaded from www.milestonesys.com/downloads. Here you must locate and download two installers, the *Milestone XProtect LPR Plugin* installer and the *Milestone XProtect LPR Server* installer.

- Run the *Milestone XProtect LPR Plugin* installer on (all) the machine(s) where your XProtect Management Client or Managemement Application and XProtect Event Server are installed.

- Run the *Milestone XProtect LPR Server* installer on one or more machines especially allocated for the purpose. If preferred, you can use virtual machines for this purpose. You are recommended **not** to install the *Milestone XProtect LPR Server* on the same machine as your XProtect Management Server or Recording Server(s).

You are recommended to install the *Milestone XProtect LPR Plugin* first*.*

1. For both installers, open the installer file.

   Tip: Depending on your security settings, you may receive one or more security warnings (*Do you want to run or save this file?, Do you want to run this software?* or similar; exact wording depends on your browser version). When this is the case, accept the security warnings (by clicking **Run** or similar; exact button names depend on your browser version).

2. The XProtect LPR installer wizard begins. In the wizard, click **Continue** and follow the installation instructions.

When installation is done, make sure you have the needed licenses (see "LPR Licenses" on page 6) for your XProtect LPR to run correctly.

If, after the XProtect LPR system installation, you need to install more LPR servers, simply run the *Milestone XProtect LPR Server* installer and make sure that it is pointing to your XProtect Corporate or XProtect Enterprise setup.

LPR servers, sources and lists

To run XProtect LPR your must install (see "Install XProtect LPR" on page 10):

- at least one LPR Server

- the LPR plug-in on all machines running the XProtect Management Client or Managemement Application and the XProtect Event Server.

Your XProtect Management Client or Managemement Application automatically lists available LPR servers in the **LPR Servers** list in the Management Client's Site Navigation Pane or Management Application's navigation pane. Expand **Servers** and select **LPR Servers.**

Tip: If a recently installed LPR server is not visible in the list, click **F5** on your keyboard to refresh.

You **cannot** add LPR servers from the XProtect Management Client or Managemement Application. They are added during the XProtect LPR installation or by subsequent LPR server installation (see "LPR Licenses" on page 6).

View LPR server information

1. In the Management Client's Site Navigation Pane or Management Application's navigation pane, expand **Servers**, select **LPR Servers.**

2. Go to the Overview pane.   Select the wanted LPR server. The first part of the name of the LPR server consists of the name of the host machine where the LPR server is installed, like this: *MYHOST.domainname.country*

3. The **LPR Server** window opens with a summary of the server's status. From here the following properties are available:

   o **Name:** Lets you change the name of the LPR server.

   o **Host name:** Shows the LPR server host name.

   o **Status:** Shows the status of the LPR server.

     If the system is running without problems, the status will return *All LPR cameras running*. Alternatively the system might return:

     - *Service not responding*

     - *Not connected to surveillance system*

     - *Service not running*

     - *Event Server not connected*

     - *Unknown error*

     - *X of Y LPR cameras running*

   o **Service up time:** Shows up time since the LPR server was last down.

- o **CPU usage:** Shows current CPU usage on the **entire** machine where the LPR server is installed.

- o **Memory available:** Shows how much physical memory is available on the LPR server.

- o **License plates detected:** Shows how many license plates have been recognized by the LPR server since it was last down.

- o **LPR cameras:** Shows which LPR cameras are running on the LPR server and their status.

- o **LPR cameras available:** Based on your license, this shows how many remaining LPR cameras (devices) you are allowed to create and use on **all** your LPR servers in total.

  License Plate Libraries available: Based on your license, this shows how many remaining License Plate Libraries you are allowed to use on **all** your LPR servers in total. It also indicates which License Plate Libraries are already in use on your **all** your LPR servers.

- o Finally, license expiration data is displayed.

Add new LPR camera

1. In the Management Client's Site Navigation Pane or Management Application's navigation pane, expand **Servers**, expand **LPR Servers**, and select **LPR Camera**.

2. Go to the Overview pane.   In the **LPR Cameras** list, select the wanted LPR camera and right-click it.

3. From the menu that appears, select **Add New...**. In the **Select Camera** window, from the list of cameras in your system, select a camera to add as an LPR camera. Click **OK**.

4. The **LPR Camera** window opens. Before you can configure LPR settings for the selected camera, you must make a test image (see "Select image for test" on page 15).

5. Furthermore, the **LPR camera** window contains the following tabs:

   a) **Info** tab (on page 14)

   b) **Settings** tab (on page 14), with the following sub-tabs:

      1. **Recognition Area** tab (on page 15)

      2. **Character Height** tab (on page 17)

      3. **Reading Direction** tab (on page 17)

      4. **Stop Criteria** tab (see "Processing tab" on page 17)

   c) **List** tab (on page 18)

   d) **Countries** tab (on page 18).

   Edit/fill out the needed properties on these tabs.

6. Optionally, you can test the results of your LPR camera. To do so, click **Test...** (see "**Test current LPR configuration**" on page 19). When done, click **Close.**

7. If prompted, confirm to save changes.

Your list of cameras also contains cameras from any available slave systems.

Due to technical restrains, however, if you have XProtect Enterprise slave systems, some of these might not be available in this view.
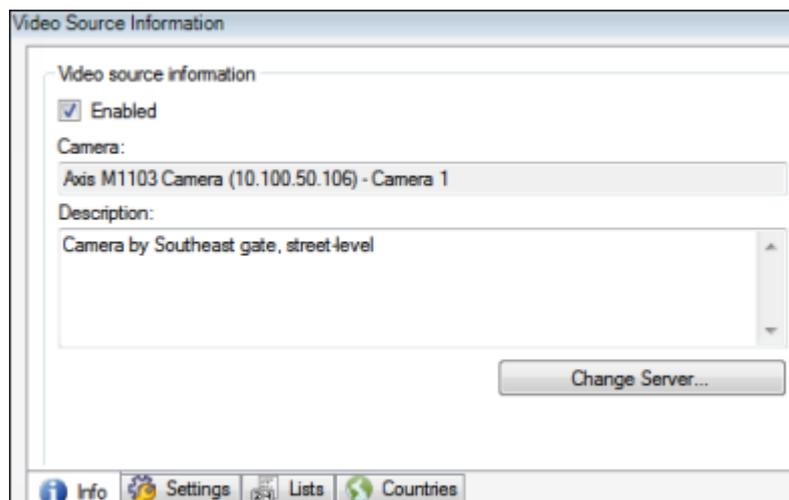
LPR camera settings

From the **LPR Camera Information** window, you can configure LPR settings for the selected camera.

Info tab

Here the selected LPR camera is identified:

- **Enabled:** LPR cameras are by default enabled meaning that they are used for LPR. If a camera should not be used for LPR, you must disable it.

  Disabling LPR on a camera does not stop it from performing normal recording in XProtect Corporate or XProtect Enterprise.

- **Camera:** Name of the selected camera as it appears in the XProtect Management Client or Managemement Application as well as in clients.

- **Description:** Enter a description (optional).

- **Change Server...**: Click to change LPR server.

  Tip: Changing LPR server might be a good idea with regards to load balancing. For example, if an LPR server is beginning to max out on CPU load, moving one or more LPR cameras to another LPR server is recommended.

Settings tab

The **Settings** tab consists of a **Select Image...** button (see "Select image for test" on page 15) and a number of sub-tabs for recognition settings:

- **Recognition Area** (see "**Recognition Area tab**" on page 15)

- **Character Height** (see "**Character Height tab**" on page 17)

- **Reading Direction** (see "**Reading Direction tab**" on page 17)

- **Processing** (see "**Processing tab**" on page 17)

This allows you to select a test image and set recognition settings for a specific LPR camera.

Select image for test

Before you can work with LPR camera settings you must capture a test image, which is used to visualize the effect of the LPR camera settings as they are applied.

1. Click **Select Image...** and select **Capture Image.** Use **Previous** and **Next** to browse.

2. When you are satisfied with a snapshot, click **OK**.

3. Proceed to specify LPR settings on the sub-tabs as needed.

See individual sub-tabs for details of their functionality.

When you are done specifying settings for your LPR system, test your setup (see "Test current LPR configuration" on page 19) in live view to see if it recognizes license plates as expected.

Recognition Area tab

Here you specify the area of the camera image to be used for recognition. To ensure the best possible performance and low risk of false detection, it is highly recommended to select a clearly defined and "well-trimmed" recognition area. 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.

You should avoided completely including irrelevant moving objects such as people, trees, or traffic in the recognition area. Eliminating irrelevant elements and areas in the recognition area is very important to systems performance. If to many irrelevant items are included in the recognition area, this results in "noise" and too many resources spent on analyzing and detecting these irrelevant items instead of license plates.
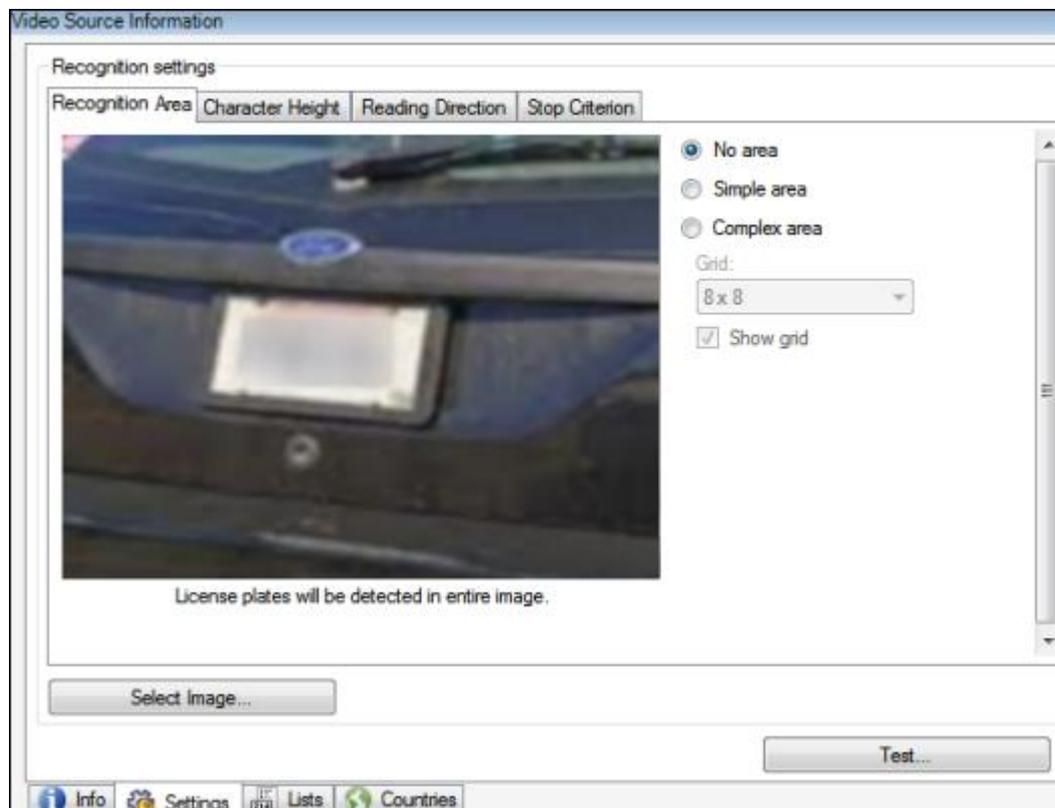
When selecting an area of recognition, you have the following options:

- **No area:** The entire image is used for LPR. Note that you do not **have** to select a recognition area, but it is recommended to do so.

- **Simple area:** The simple recognition area is a rectangular area. Therefore, only the upper-left and lower-right corner must be specified. Click the top left of the area and drag the mouse pointer to the bottom right to define your rectangle.

- **Complex area:** The image is divided into a matrix of small equally sized rectangles. Each rectangle can be selected by a mouse click. An area is excluded (discarded) by clicking it with the right mouse button and included (processed) by clicking the left mouse button. With a pressed mouse button, drag over the image to include or exclude several areas at a time. If you select **Complex area**, you may fill in the properties for:

    o **Grid:** Set the wanted grid size (8 x 8, 16 x 16 or 32 x 32) for the rectangles.

    o **Show grid:** Clear this to turn off the graphical representation of rectangles in the image.

If you have specified an area of recognition, the excluded area is shown as red shaded in the image of the main window.

Character Height tab

Here you define the minimum and maximum height of the license plate characters (in percent).

These character settings influence the recognition process as they partly determine the recognition time. As a rule, the larger the difference between the minimum and the maximum character size:

1. the more complex the LPR process is

2. the higher the CPU load is

3. the longer you have to wait for the results.

You see a shaded area in the test image (see "Select image for test" on page 15) containing *ABC 123*. Since this shaded area grows/shrinks proportionally with the current character setting in the min/max character setting fields to the right, you can use this shaded area to drag the text on top of the license plate in the captured image, to compare license plate characters in the image.

- **Minimum character height:** Use the arrows to set the minimum hight of characters to be included for LPR. Any license plates containing characters below this threshold is not included in LPR.

- **Maximum character height:** Use the arrows to set the maximum hight of characters to be included for LPR. Any license plates containing characters above this threshold is not included in LPR.

Reading Direction tab

Here you specify reading direction for the shaded area containing *ABC 123* and color inversion for the test image. The text in the shaded area must follow the direction of the test image, for the recognition to function correctly.

- **Do not rotate:** Shaded area stays as it is.

- **Rotate 90 degrees:** Shaded area rotates 90° to the right.

- **Rotate 180 degrees:** Shaded area rotates 180° to the right.

- **Rotate 270 degrees:** Shaded area rotates 270° to the right.

- **Flip:** Shaded area is mirrored.

- **Invert:** Colors of the test image is inverted.

Processing tab

Basically, the recognition process can be divided into two major steps: finding the plate(s) and recognizing the characters on the plates. However, the items on the **Processing** tab allow a user to define a trade-off between processing speed and recognition quality.

The general rule states that high recognition quality:

- needs the highest computational effort

- results in higher CPU load

- requires more time to return an answer.

By tuning the settings on the **Processing** tab, a trade-off between processing speed and recognition quality can be defined. Thus the recognition process halts if any of the stop criteria are met. Furthermore, limiting the processing frame rate allows using a higher frame rate on the camera without adding an unnecessary load to the LPR server.

- **Use at most:** Enables the usage of milliseconds per frame (number of milliseconds per frame allowed to be spent on the recognition of one image) as a stop criterion. Default setting is disabled. If enabled, default value is *0*. If adjusted, recommended value is *200* ms per frame.

- **Stop processing license plate when:** Enables a minimum confidence level (in percent) as a stop criterion. Default setting is enabled and default value is *80%*. Change the default value if needed. The recognition process continues until the system is at least 80% sure of the identity of a license plate.

- **Detect at most:** Enables maximum number of license plates returned per frame as a stop criterion. Default setting is enabled and default value is *1*. Change the default value if needed.

  Tip: Increase the **Detect at most** default value if, for example, you are detecting multiple lanes with the same LPR camera.

- **Reject license plates below:** Enables a minimum confidence level (in percent) as a stop criterion. Default setting is disabled. Also, specify the minimum value in percent. The system rejects license plates where the confidence level is equal to or lower than the specified value.

- **Limit processing to:** Enables a limit to the amount of frames being processed per second (FPS). Default setting is enabled and default value is *4* FPS. If you limit FPS, the system can use a higher FPS on the camera for recording without adding unnecessary load to the LPR Server.

- **Interlaced:** For best performance, select this with interlace cameras.

Whenever one of the above stopping criteria is met, the recognition process stops and returns the answer found so far.

List tab

Here you select which license plate list(s) a specific LPR camera should match license plates against. You can create as many lists as needed (see "Add new license plate list" on page 21).

- **All:** License plates are matched against all available lists.

- **Selected:** Choose one or more of the available lists. License plates are matched against selected lists.

Tip: Events are only generated for selected lists.

When you are done specifying settings for your LPR system, test your setup (see "Test current LPR configuration" on page 19) in live view to see if it recognizes license plates as expected.

Countries tab

Here you select which license plate libraries this specific LPR camera should use. What you can select from, depends on which libraries you have installed (see "Install XProtect LPR" on page 10) and your license situation (see "LPR Licenses" on page 6).

When you are done specifying settings for your LPR system, test your setup (see "Test current LPR configuration" on page 19) in live view to see if it recognizes license plates as expected.

Test current LPR configuration

Why is it a good idea to test your LPR setup? Because it can help you test—among other things—if your system recognizes any license plates at all, and if so, if it is the correct kind of license plates? It can also help you decide if your confidence level is set correctly and if your system configuration is fully optimized. All important issues designed to lower the CPU usage of the machines running your LPR setup.

1. From the **Settings** tab (on page 14), **List** tab (on page 18) or **Countries** tab (on page 18) click **Test...**.

2. The live view **Test Preview** window opens, offering test information on the first license plate in the list.

    Tip: By default, the first license plate in the list is the first license plate detected. To get information on another license plate, select it.

    The information shown is:

    o **Status:** Status of the preview process.

       The following normal/positive statuses are possible:

       *   *Initializing...*

       *   *Initializing LPR...*

       *   *Recognizing license plates...*

       *   *The maximum number of license plates have been detected*

       The following error statuses are possible:

       *   *Authentication error*

       *   *Event Server not responding*

       *   *Event Server not registered*

       *   *Image Server not responding*

       *   *LPR Server not responding*

       *   *LPR Server not registered*

       *   *Unknown error*

    o **Camera name:** Name of the active LPR camera.

    o **Detected license plates:** A list of the latest recognized license plate(s) (max. 10 plates).

    o **License Plate Library:** The license plate library used to detect the license plate.

- o **Character height:** The height of characters (see "Character Height tab" on page 17) on the recognized license plate (in percent).

- o **Confidence:** The percent of confidence (see "Processing tab" on page 17) with which the license plate has been recognized.

- o **Lists:** The license plate list(s) (see "Working with license plate lists" on page 21) used to recognize the license plate.

3. When done previewing/testing your LPR configuration, click **Close** to exit the **Test Preview** window.

Your can use the previewer as many times as you like and on any LPR camera and with any configuration you prefer.

Note that this view is only a live preview and only runs for five minutes. Furthermore, the settings used for the preview are not saved until you exit the **LPR camera Information** window (see "LPR camera settings" on page 14) and save them.

How to reduce CPU load in LPR

If your system is not configured correctly, running an LPR setup can easily result in heavy CPU load on your LPR servers. The following guidelines can help you reduce your CPU load to an acceptable level.

- Set video resolution as low as possible, still keeping license plates clearly visible. Use the **XProtect Corporate or XProtect Enterprise's** Management Client or Managemement Application (the **Settings** tab of the relevant LPR camera).

- Reduce video frame rate to match the traffic speed. This is done by limiting the processing frame rate in the LPR camera configuration. Use the **XProtect Corporate or XProtect Enterprise's** Management Client or Managemement Application (the Settings tab of the relevant LPR camera).

- Set as small a recognition area as possible. And ensure that static high contrast areas (especially containing text) are not included in the recognition area. Use the the **Complex area** option (see "Recognition Area tab" on page 15).

- Minimize the difference between minimum and maximum character height. Use the **Character Height** (see "**Character Height tab**" on page 17) tab.

- Play around with the processing options and closely follow the effect of what you are doing on the CPU load of the relevant LPR machines. Use the **Processing** tab (on page 17).

- Try the following to quickly verify your changes:

  Run the test preview (see "Test current LPR configuration" on page 19) with, for example:

  - o leaves moving in the wind

  - o traffic or people moving

  - o a parking sign or similar

  - o complex structures of some kind (a design pattern or similar)visible in the picture. Check the CPU load of the LPR server(s) with this setup. Next, optimize the setup by eliminating

moving/disturbing objects (leaves, people, traffic, signs, patterns, etc.) from the picture and recheck the CPU load (which should be going down). Keep optimizing the picture by removing more unwanted objects and eliminating everything but the license plate and watch the CPU load go down until you are satisfied with the result.

Working with license plate lists

License plate lists are collections of license plates that you want your LPR solution to treat in a special way. License plate recognitions are matched against these lists and if there is a match, an LPR event is triggered. These events are stored on the event server and can be searched for and viewed in the XProtect Smart Client on the **LPR** tab. By default, events are only stored for 24 hours. To change this, open the **Options** dialog and on the **Event Server Settings** tab, in the **Keep events for** field, enter a new time frame.

When you have specified a LPR list, you can set up additional events and alarms to be triggered when a license plate is matched against the list.

Examples:

o   A company HQ uses a list of executive management's company car license plates to grant executives access to a VIP parking area. When executives' license plates are recognized, the LPR solution triggers an output signal opening the gate to the VIP parking area.

Example of how the company's License Plate Lists might look.

o   A chain of gas stations creates a list of license plates from vehicles which have previously left gas stations without paying for their gas. When such license plates are recognized, the LPR solution triggers output signals activating an alarm and temporarily blocking the gas supply to certain gas pumps.

What happens when a system event is triggered? This is highly individual, as it depends entirely upon the configuration of your system. In connection with LPR, triggered events are often used to subsequently trigger output signals for raising of parking barriers, etc. However, triggered events can also be used for making cameras record in high quality or similar. You can even use an event to trigger combinations of such actions.

For more information about coupling events with actions, see *Milestone XProtect Corporate or XProtect Enterprise Administrator's Manual*, available on the surveillance system software DVDs or from www.milestonesys.com/downloads.

Add new license plate list

1.   In the Management Client's Site Navigation Pane or Management Application's navigation pane, expand **Servers**, select **License Plate Lists**.

2.   Go to the Overview pane.   In the **License Plate List**, right-click and select **Add new...**.

3. In the window that appears, give the list a name and define its properties (see "License plate list properties" on page 22).

4. If prompted, confirm to save changes.

5. As soon as you have created a license plate list (see "Working with license plate lists" on page 21), it becomes visible in the **License Plate List** and on the **Lists** tab of your LPR camera (see "Add new LPR camera" on page 12).

It is also possible to use wild-card license plate lists (see "Manage license plate lists" on page 22).

Manage license plate lists

1. In the Management Client's Site Navigation Pane or Management Application's navigation pane, expand **Servers** and select **License Plate Lists.**

2. Go to the Overview pane.   Double-click the wanted **License plate List**.

3. The **License Plate List Information** window opens. Edit/fill out the needed properties (see "License plate list properties" on page 22).

4. If prompted, confirm to save changes.

License plate list properties

- **Name:** Name of the list.

- **Search:** Lets you search the list for specific license plates, numbers, patterns or similar. Use *?* as a single wildcard if needed.

- **Add:** Lets you add a license plate.

  Do not include any spaces and always use capital letters.

  Examples: *ABC123* (correct), *ABC 123* (incorrect), *abc123* (incorrect)

  It is also possible to add wild-card 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.

  Also note that 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: 06759 ·٦٧٥٩

- **Delete:** Lets you delete the selected license plate(s).

- **Import:** Lets you import license plates from any line-separated text file, for example a .txt-file.

  Tip: Use for example, Windows' Notepad® for creating .txt files for import.

- **Export:** Lets you export the entire license plate list to a line-separated text file.

- **Page size:** Lets you choose (in intervals) between 50 - 1000 rows, indicating how many license plates should be shown in one page (one screen).

- **Events triggered by list match:** Lets you select which event(s) should be triggered by a list match (see "Events based on LPR" on page 24). It is possible to choose between all available types of events available in your XProtect Corporate or XProtect Enterprise.

About unlisted license plates list

You would normally trigger a surveillance system event based on recognition of license plates which are included on your lists. However, you can also trigger a surveillance system event with a license plate, which is **not** on a 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 which is not on 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, if a license plate, which is **not** on a list, is recognized, use the **Unlisted License Plate** list. It is selected like any other list (see "List tab" on page 18).

Events based on LPR

You can associate all types of events available in your XProtect Corporate or XProtect Enterprise with a license plate list. However you must first create a license plate list (see "Add new license plate list" on page 21). Do the following:

As soon as you have created a license plate list (see "Working with license plate lists" on page 21), it becomes visible in the **License Plate List** and on the **Lists** tab of your LPR camera (see "Add new LPR camera" on page 12).

1. In the **License Plate List Information** window (see "Manage license plate lists" on page 22), by the **Events triggered by list match** selection field, click **Select...**.

2. In the **Select Events Triggered** picker, select the required event.

3. If prompted, confirm to save changes.

4. The event is now associated with recognitions on the selected license plate list.

What happens when a system event is triggered? This is highly individual, as it depends entirely upon the configuration of your system. In connection with LPR, triggered events are often used to subsequently trigger output signals for raising of parking barriers, etc. However, triggered events can also be used for making cameras record in high quality or similar. You can even use an event to trigger combinations of such actions.

If you want to trigger an event if a license plate, which is not on a list, is recognized, you can use the **Unlisted License Plates** list (see "About unlisted license plates list" on page 23).

Alarms based on LPR

You can base some types of alarms on LPR recognitions. Do the following:

As soon as you have created a license plate list (see "Working with license plate lists" on page 21), it becomes visible in the **License Plate List** and on the **Lists** tab of your LPR camera (see "Add new LPR camera" on page 12).

1. Create the license plate list (see "Add new license plate list" on page 21) you want to match license plates against.

2. Add and configure the LPR camera(s) (see "Add new LPR camera" on page 12) you want to use.

3. In the Management Client's Site Navigation Pane or Management Application's navigation pane, expand **Alarms**, right-click **Alarm Definitions**. Select to create a new alarm.

4. The **Alarm Definition Information** window appears. Fill in the relevant properties (see "Alarm properties" on page 25).

5. If prompted when done, confirm to save changes.

Alarm properties

Set the following properties when creating an LPR alarm:

*   **Enable:** Lets you enable the Alarms feature.

*   **Name:** Lets you type a name for the LPR alarm. The alarm's name appears whenever the alarm is listed.

    Tip: Alarm names do not have to be unique, but using unique and descriptive alarm names are advantageous in many situations.

*   **Description:** Lets you type a description text (optional).

*   **Triggering event:** Lets you select the (event) message that triggers the alarm:

a) In the top drop-down, decide what type of event to use for the alarm. When you run LPR, beside system-related events and plug-ins, the list offers **License Plate Lists** events (see "Working with license plate lists" on page 21) and **LPR Server** events (see "View LPR server information" on page 11). Select one or the other, depending on your needs.

b)   In the second drop-down, select the specific event message to use. If you selected **License Plate Lists** in the drop-down above, select between your license plate lists. If you selected **License Plate Recognition Server**, select the relevant LPR server error message:

LPR server triggering events messages.

- **LPR cameras:** Lets you select which LPR camera(s) or server(s), the event should originate from.

- For alarm activation, choose between **Time profile** and **Event based:**

  o **Time profile:** If you select **Time profile**, you must select when the LPR alarm should be activated for triggering. If you have no time profiles, you are only able to select **Always**. If you have defined time profiles, they are selectable from this list.

  o **Event based:** If you select **Event based**, you must select which events should start and stop the LPR alarm. Events available for selection are hardware events defined on cameras, video servers and input. Also global/manual and user-defined event definitions can be used.

Primary part of LPR **Alarm Definition Information** window.

- Choose the time limit within which operator action is required, and what event to trigger when the time limit is reached:

- o **Time limit:** Lets you select a time limit for when operator action is required. Default setting is 1 minute. The time limit is not active before an event is attached.

- o **Events triggered:** Lets you select which event to trigger when the time limit has been reached.

- Choose additional settings:

  - o **Related cameras:** Lets you select (a maximum of 15) cameras for inclusion in the LPR alarm definition (note that they do not trigger the alarm themselves).

  - o **Related map:** Lets you assign a map to the LPR alarm when it is listed in the XProtect Smart Client's *Alarm Manager*.

  - o **Initial alarm owner:** Lets you select a default user responsible for the LPR alarm.

  - o **Initial alarm priority:** Lets you select a priority (**High**, **Medium** or **Low**) for the LPR alarm. Priorities can be used for sorting purposes and workflow control in the XProtect Smart Client.

  - o **Initial Alarm Category:** Lets you select an alarm category for the LPR alarm. This could be for example *False alarm* or *Needs investigation*.

  - o **Event triggered by alarm:** Lets you define an event to be triggered by the LPR alarm in the XProtect Smart Client (if needed).

Tip: If you want to disable the new alarm from the beginning, clear the **Enable** check box in the upper left corner before saving.

LPR in XProtect Smart Client

The XProtect Smart Client is the access client used for viewing LPR video and must be installed on every computer used for this purpose. Any LPR related events or alarms are displayed in the XProtect Smart Client on the **LPR** tab.

Viewing and investigating license plate events

License plate recognition (LPR) uses optical character recognition on images to read vehicle registration plates and to extract the alphanumerics of the license plate and store these as records in the system. This information generates events in the system. You can monitor LPR events on the **Live** tab as these are recorded in the system, and you can view and investigate particular LPR events on the **LPR** tab.

The **Live** tab lets you view several LPR cameras in a view at once, giving you a full overview of all the live LPR events associated with these cameras. Each time a camera captures a license plate number, it appears on the list of license plates next to the camera feed. In setup mode, you can change the settings (see "LPR settings" on page 30) that define how the list of license plate numbers is displayed.

The **LPR** tab provides a dedicated view of all your LPR events. The **LPR** tab includes an LPR events list, an LPR preview (for previewing video associated with individual LPR events) and details of the license plate and the list it is associated with.

You can easily search for license plates and see the lists that they are assigned to and review any related footage. The filter option lets you view license plates from a particular time, country, LPR camera or license plate list. You can also add license plate to lists, for example, an employee list or a guests list, or remove them as needed.

LPR on the Live tab

On the **Live** tab, you can view the video that generates the LPR events, displayed as a list of license plates on the right of the video.

When you click any of the license plates in the list, the live video automatically pauses and changes to independent playback. To go back to viewing live video, either click the license plate again or click the **Independent playback** icon on the camera toolbar.

Add LPR cameras to views

1. On the **Live** tab, in setup mode, select the view you want to add an LPR camera to.

2. In the **System overview** pane, click **LPR** and drag it to the relevant position in the view.

3. In the **Select LPR Camera** dialog that appears, expand the required server to view a list of available LPR cameras from that server.

You can specify how you want to display LPR camera events on the Live tab in the **Properties** pane (see "LPR settings" on page 30).

LPR settings

LPR camera	Displays the name of the LPR camera that generates the list of license plate numbers displayed on the right.
	To change the camera, click the ellipsis button to open the **Select LPR Camera** dialog and select a different LPR camera. If you want to display the list of license plates from one camera but want to view video from another, select a different camera in the **Camera name** field.
License plate list	Choose the order of how you want to display your lists:
	Newest on top: Display the newest LPR events at the top of the list.
	Newest on bottom: Display the newest LPR events at the bottom of the list.

The LPR tab

The LPR tab lets you investigate LPR events from all your LPR cameras.

The tab shows a list of LPR events. You can filter the list (see "Filter LPR events" on page 31) according to date, country or state, source of the event or list. Use the **Search** field to search for a particular license plate number. By default this list displays LPR events from the last 24 hours.

You can search, add (see "Add license plates to license plate lists" on page 31) and remove (see "Remove license plates from lists" on page 31) numbers from existing lists by using the License Plate Lists function.

The LPR Events list

The LPR Events list displays all the LPR events, with the most recent events at the top of the list. By default this list displays LPR events from the last 24 hours, however, this can be changed in the management client or management application.

When you select an LPR event from the list, the preview on the right lets you view the related video sequence for the event. The preview camera title bar, shows the LPR camera from where the LPR event was triggered. You also see the license plate number, country code, time of the event and the list it is assigned to.

You can change how the LPR event list displays events; you can sort columns and you can drag the columns to different positions. You can also use the filters at the top of the list to filter LPR events (on page 31).

The event list only displays LPR events from the time of your search or filter. If you want to see the latest LPR events, click the **Refresh** button.

To allow for optimum performance, the list only displays a maximum of 100 LPR events at a time. To browse to the previous/next 100 LPR events, use the buttons in the top right of the LPR event list: < 201-300 > .

Filter LPR events

There are several ways you can filter the LPR event list, so it displays just the LPR events that you are interested in; you can click any of the filters at the top of the list to see only LPR events associated with that filter. Any filters you apply are immediately reflected in the list.

- **Period:** Select one of the available time periods to see LPR events for that particular period. For example, click Today to see only LPR events that took place today or use the custom interval to specify a particular time period.

- **Country code:** Clear or select country or state codes to view only LPR events linked to a license plate from a particular country or state.

- **LPR camera:** Select one or more of the available LPR cameras to view only LPR events for those cameras.

- **License plate list:** Select one or more License plate list to view only LPR events generated by those lists.

You can combine filters (for example, for a particular country code on a certain date).

You can also use the **Search** field to search for a particular license plate. Enter a combination of characters to bring up results with combinations of those characters. For example, if you enter the characters "XY 12," you will get license plates that have both XY and 12 in their number.

Add license plates to license plate lists

1. On the **LPR** tab, at the top right of the window, click L**icense Plate Lists** to open the **License Plate Lists** dialog.

2. In **Select License Plate List**, select the relevant list you want to add the license plate to.

3. In the **Search** field, enter the license plate number and then click **Add**. You can add the same number to several lists: just select a new list and click **Add** again.

4. Click **Close**.

Remove license plates from lists

1. On the **LPR** tab, select the relevant LPR event and right-click to select **Remove from list**. Alternatively, on the right, below the preview, click the **Remove from list** icon or use the **License Plate Lists** dialog.

2. Confirm that you want to remove the specified license plate from the list.

   Removing the license plate from a list, does not remove it from the **LPR Events** list, because this reflects LPR events that have taken place.

About LPR cameras

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. However, when choosing cameras for LPR, only the small part of the images which contains the actual license plate is important.

Choose the right camera

When optimizing the small part of the images containing the actual license plate, keep some basic features in mind:

- **Resolution:** Choose cameras which have a sufficient resolution.

- **Dynamic range:** Choose cameras that have a sufficient dynamic range. A camera's dynamic range determines, among other things, its sensitivity in low- and high-light conditions, how it reacts to changing light conditions, and how sensitive it is to infrared lighting.

- **Shutter speed:** Choose cameras that give you the ability to set a shutter speed (see "Lens and shutter speed" on page 33) fitting your requirements.

- **Undesired features:** Choose cameras that give you the ability to disable image enhancement techniques (see "Unwanted camera features" on page 37), such as auto-gain and contrast/contour enhancement. For LPR, you generally want your images as raw as possible.

- **Lenses:** Choose cameras that have—or let you choose—lenses which are suitable for your required camera resolution and your external lighting conditions. For example, when infrared lighting is used it is preferable to also use a lens with an infrared pass filter or at least a lens which is compensated for infrared light. Otherwise you get a focus shift when the environment gets dark. To achieve a better dynamic range for your camera it is sometimes recommended to use a lens with auto-iris.

  o **Iris** is the adjustable opening (a.k.a. aperture) used for controlling the amount of light coming through a lens. Iris thus has a significant effect on the exposure of images.

- **Infrared cameras:** Only choose infrared camera if conditions allow. If a license plate has several background colors, there might be situations where infrared cameras cannot be used. On the plate shown below, the red color makes it impossible to read the white letters on the upper half of the plate when recorded with an infrared camera.

Left: With normal camera.

Right: With infrared camera.

Contrast

When determining the right contrast for LPR, 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

Too little contrast; recognition is not 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 color value difference between a pixel in the foreground and a pixel in the background should be at least 15.

Note that "noise" in the image (see "Unwanted camera features" on page 37), the use of compression (see "Unwanted camera features" on page 37), light, or similar can make it difficult to determine what the colors of a license plate's characters and background are.

Lens and shutter speed

When configuring cameras' 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—when the camera supports manual configuration of the shutter time—the shutter time can be set to very short.

  - o **Neutral Density** (ND) filters or (gray filters) basically reduce the amount of light coming into a camera; effectively working as "sunglasses" for the camera. ND filters thus affect the exposure of images (see "Physical positioning of cameras" on page 35).

- **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. Note that when using 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 rule for determining the longest suitable shutter time is:

- o **Vehicle speed in km/h:** Shutter time in seconds = 1 second / (11 × max vehicle speed in kilometers per hour)

- o **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 at different vehicle speeds:

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

Physical environment

When mounting and using cameras for LPR, note the following environmental factors:

- **Much light:** Too much light in the environment can lead to overexposure or smear.

- o **Overexposure** is when images are exposed to too much light, resulting a in a burnt-out and overly white appearance. To avoid overexposure it is recommended that you use a camera with a high dynamic range and/or use an auto-iris lens. **Iris** is the adjustable opening (a.k.a. aperture) used for controlling the amount of light coming through a lens. Iris thus has a significant effect on the exposure of images.

- o **Smear** is an effect leading to unwanted light vertical lines in images; it is frequently linked to slight imperfections in cameras' charge-coupled device (CCD) imagers (the sensors used to digitally create the images). In general, CCD imagers with large surfaces are less sensitive to smear than CCD imagers with small surfaces. Cameras with complementary metal–oxide–semiconductor (CMOS) imagers (a different type of sensors, with a higher noise immunity) are less sensitive to smear than cameras with CCD imagers.

License plate image with smear

- **Little light:** Too little environmental or external lighting can lead to underexposure.

  - o **Underexposure** is when images are exposed to too little light, resulting in a dark image with hardly any contrast. When auto-gain (see "Unwanted camera features" on page 37) cannot be disabled or when you are not able to configure a maximum allowed shutter time (see "Lens and shutter speed" on page 33) for capturing moving vehicles, too little light will initially lead to gain noise and motion blur in the images, and ultimately to underexposure. Underexposure can be avoided by using sufficient external lighting and/or by using a camera which has sufficient sensitivity in low-light environments without using gain. In general, cameras which have CCD imagers with large surfaces are more light-sensitive than cameras which have CCD imagers with small surfaces.

- **Infrared:** Another popular way of overcoming difficult environmental lighting conditions is to 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.

  - o **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; at night they can thus 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, etc.:** Snow, very bright sunlight, etc. may require special configuration of cameras.

- **Plate condition:** Vehicles may have damaged license plates. License plates may occasionally have been damaged deliberately in an attempt to avoid recognition. Vehicles may also simply have dirty license plates.

- **Camera condition:** Camera lenses may accumulate dirt over time.

Physical positioning of cameras

When mounting cameras for LPR, note the following:

- **Single-line rule:** Mount the camera in such a way that you are able to take an image of a single line license plate recorded by the camera, and draw a horizontal line that crosses both the left and right edge of the license plate:
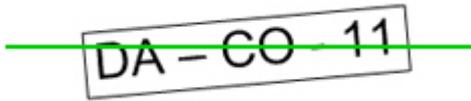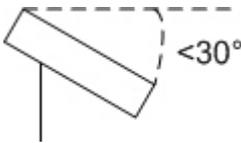

Acceptable mounting

Incorrect mounting

- **Plate in image center:** Mount the camera in such way that an ideal image of the license plate is captured when the license plate is in the center of the recorded image.

- **Vertical angle:** The maximum vertical view angle of a camera used for LPR is 30°:

- **Horizontal angle:** The maximum horizontal view angle of a camera used for LPR is 25°. In most systems the horizontal angle is somewhere between 15° and 20°.

- **Blocking objects:** Avoid possible blocking objects in the view path of the camera, such as pillars, barriers, fences, gates, etc. Remember that barriers, gates, etc. are likely to be movable between different positions.

Resolution

The term *pixels per stroke* is used to define a minimum requirement for LPR. The following illustration outlines what is meant by *stroke*:

Because the thickness of strokes depends on country and 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.

- For single line US plates (plate width 30.5 cm; stroke width around 0.7 cm) this typically means that the plate width in the image must be at least 130 pixels.

- For single line European style plates (plate width 52 cm; stroke width around 1 cm) this typically means that the plate width in the image must be at least 170 pixels.

When vehicles are moving when recorded, and an interlaced camera is used, only a half of image can be used (only the even lines). This means that the resolution requirements almost must be doubled.

- For single line US plates (plate width 30.5 cm; stroke width around 0.7 cm) this typically means that the plate width in the image must be at least 215 pixels.

- For single line European style plates (plate width 52 cm; stroke width around 1 cm) this typically means that the plate width in the image must be at least 280 pixels.

What is interlacing? Interlacing is a method determining how an image is refreshed when shown on a screen. With interlacing, the image is refreshed by first scanning every other line in the image, then scanning every opposite line, and so forth. This allows for a faster refresh rate because less information must be processed during each scan. However, in some situations, interlacing may cause flickering, or the changes in only half of the image's lines for each scan may be noticeable.

Interlaced image of a moving car

Unwanted camera features

When configuring cameras for LPR, note the following:

- **Automatic gain adjustment:** One of the most common types of image interference caused by cameras is gain noise.

  o **Gain** is basically the way in which a camera takes 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 not always helpful for cameras used for LPR. It is therefore recommended that you configure your cameras' auto-gain functionality to be as low as possible. Alternatively, disable the cameras's auto-gain functionality altogether.
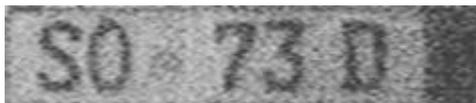
License plate image with gain noise

Tip: In dark environments, gain noise can also be avoided when your external lighting is sufficient.

- **Automatic enhancement:** Some cameras use contour, edge or contrast enhancement algorithms to make images look better to the human eye. However, such algorithms can

interfere with the algorithms used in the LPR process. It is therefore recommended that you disable 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 "Resolution" on page 36) is required in order to achieve optimal LPR performance. If JPEG compression is used, it will have almost no negative influence on license LPR, 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.

Left: License plate image saved with a JPEG quality level of 80% (i.e. low compression); acceptable

Right: License plate image saved with a JPEG quality level of 50% (i.e. high compression); unacceptable

LPR Server Services

When you have installed an LPR server, you can check the state of its services locally via the XProtect LPR Server Manager.

This is done via the **LPR Server Manager** icon in the notification area of the **computer running the LPR server**. The notification area icon also lets you start and stop the LPR Server Service, view status messages, read log files, etc.

Tip: The notification area is also known as the system tray or the tray icon. It is located at the far right of the LPR server computer's Windows taskbar.

Example: LPR Server Service
icon in notification area.

If you want a full overview of the status of all your LPR servers (see "View LPR server information" on page 11), this is obtained from the XProtect Management Client or Managemement Application.

Start and stop LPR Server Service

The LPR Server Service starts automatically. If you have stopped the service manually, you can start it manually.

1. Right-click the notification area's **LPR Server Manager** icon.

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. Right-click the notification area's **LPR Server Manager** icon.

2. From the menu that appears, select **Show LPR Server Status...**.

    If the system is running without problems, the status will return *All LPR cameras running*. Alternatively the system might return:

    - *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

Logs are very useful tools for monitoring and troubleshooting the status of the LPR service. All entries are time-stamped, with the most recent entries at the bottom.

1. Right-click the notification area's **LPR Server Manager** icon.

2. From the menu that appears, select **Show LPR Server Log File...**

3. A log-viewer appears listing all relevant server activity with precise time stamp.

Change LPR server settings

The LPR server must be able to communicate with your XProtect Management Server. You must therefore specify the IP address/hostname of the Management Server during the installation of the LPR server.

Should you later need to change the address of the Management Server, do the following:

1. Stop (see "Start and stop LPR Server Service" on page 39) the LPR Server Service.

2. Right-click the notification area's **LPR Server Manager** icon again.

3. From the menu that appears, select **Change Settings...** The **LPR Server Service Settings** window appears.

4. Specify the following properties:

   Address: Enter the IP address (example: *123.123.123.123*) or host name (example: *ourserver*) of the Management Server with which the LPR server communicates.

   Port: Enter the port number of the Management Server that the LPR server communicates with. Default port number is 80.

   User name: Enter the user name for the LPR server login.

   Password: Enter the password for the LPR server login.

Uninstall XProtect LPR

When removing XProtect LPR, bear in mind that it consists of two components that have to be removed separately.

- On the machine(s) where the **LPR plugin is installed** you must uninstall *Milestone XProtect LPR Plugin.*

- On the machine(s) where the **LPR server is installed** you must uninstall *Milestone XProtect LPR Server.*

The following procedure describes standard system component removal in recent Windows versions; the procedure may be slightly different in older Windows versions:

1. In Windows' **Start** menu, select **Control Panel**, and then...

   o If using **Category** view, find the **Programs** category, and click **Uninstall** a program.

   o If using **Small icons** or **Large icons** view, select **Programs and Features**.

2. In the list of currently installed programs, right-click the required program or service, select **Uninstall**, and follow the removal instructions.

Glossary

A

Aperture: On a camera, aperture refers to the adjustable opening (a.k.a. iris) used for controlling the amount of light coming through a lens. The aperture thus has a significant effect on the exposure of images.

D

Dynamic range: A camera's dynamic range determines, among other things, its sensitivity in low- and high-light conditions, how it reacts to changing light conditions, and how sensitive it is to infrared lighting.

E

Event: A predefined incident occurring on the surveillance system; used by the surveillance system for triggering actions. Depending on surveillance system configuration, events may be caused by input from external sensors, by recognized motion, by data received from other applications, or manually through user input. The occurrence of an event could, for example, be used for making a camera record with a particular frame rate, for activating outputs, for sending e-mail alerts, or for a combination thereof.

F

FPS: Frames Per Second, a measurement indicating the amount of information contained in video. Each frame represents a still image, but when frames are displayed in succession the illusion of motion is created. The higher the FPS, the smoother the motion will appear. Note, however, that a high FPS may also lead to a large file size when video is saved.

Frame rate: A measurement indicating the amount of information contained in motion video. Typically measured in FPS (Frames Per second).

G

Gain: Gain is basically the way in which a camera takes a picture of a scene and distributes light into it.

I

Interlacing: Interlacing is a method determining how an image is refreshed when shown on a screen. With interlacing, the image is refreshed by first scanning every other line in the image, then scanning every opposite line, and so forth. This allows for a faster refresh rate because less information must be processed during each scan. However, in some situations, interlacing may cause flickering, or the changes in only half of the image's lines for each scan may be noticeable.

Iris: On a camera, iris refers to the adjustable opening (a.k.a. aperture) used for controlling the amount of light coming through a lens. Iris thus has a significant effect on the exposure of images.

J

JPEG: An image compression method, also known as JPG or Joint Photographic Experts Group. The method is a so-called lossy compression, meaning that some image detail will be lost during compression. Images compressed this way have become generically known as JPGs or JPEGs.

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K

Keyframe: Used in the MPEG standard for digital video compression, a keyframe is a single frame stored at specified intervals. The keyframe records the entire view of the camera, whereas the following frames record only the pixels that change. This helps greatly reduce the size of MPEG files. A keyframe is similar to an I-frame.

Km/h: Kilometers per hour.

L

License plate library: A license plate library is a set of rules defining license plates of a certain type and form as belonging to a certain country or region.

License plate list: License plate lists are collections of license plates which an LPR system will treat in a special way.

LPR: License Plate Recognition, a method for video-based content analysis and recognition of vehicle license plates.

LPR camera: Defines from where an LPR setup receives video (typically a camera), and how this video is configured and processed.

M

MPEG: A group of compression standards and file formats for digital video, developed by the Moving Pictures Experts Group (MPEG). MPEG standards use so-called lossy compression as they store only the changes between frames, removing often considerable amounts of redundant information: Keyframes stored at specified intervals record the entire view of the camera, whereas the following frames record only pixels that change. This helps greatly reduce the size of MPEG files.

Mph: Miles per hour.

N

ND filter: Neutral Density filter. An ND filter (a.k.a. gray filter) basically reduces the amount of light coming into a camera; effectively working as "sunglasses" for the camera. An ND filter thus affects the exposure of images.

O

Output: Data going out of a computer. On IP surveillance systems, output is frequently used for activating devices such as gates, sirens, strobe lights, etc.

Overexposure: Overexposure is when images are exposed to too much light, resulting a in a burnt-out and overly white appearance.

P

PTZ: Pan/Zoom/Tilt; a highly movable and flexible type of camera.

S

Smear: Smear is an effect leading to unwanted light vertical lines in images; it is frequently linked to slight imperfections in cameras' CCD imagers (the sensors used to digitally create the images).

T

TCP: Transmission Control Protocol; a protocol (i.e. standard) used for sending data packets across networks. IP is often combined with another protocol, IP (Internet Protocol). The combination, known as TCP/IP, allows data packets to be sent back and forth between two points on a network for longer periods of time, and is used when connecting computers and other devices on the internet.

U

Underexposure: Underexposure is when images are exposed to too little light, resulting in a dark image with hardly any contrast.

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About Milestone Systems

Founded in 1998, Milestone Systems is the global industry leader in open platform IP video management software. The XProtect platform delivers powerful surveillance that is easy to manage, reliable and proven in thousands of customer installations around the world. With support for the widest choice in network hardware and integration with other systems, XProtect provides best-in-class solutions to video enable organizations – managing risks, protecting people and assets, optimizing processes and reducing costs. Milestone software is sold through authorized and certified partners. For more information, visit:

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