“ARTECO-LPR”
App for Samsung Open SDK.
TECHNICAL SPECIFICATIONS

Samsung hardware requirements

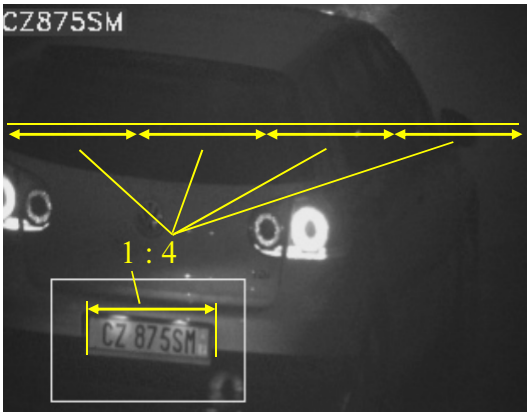
The app Arteco-LPR can run on every Wisenet-III series Samsung camera. Performance may vary depending on the lens and on plate lighting.

The best performance can be obtained with “box” cameras because those allows for mounting a suitable lens and can be installed in a custom housing with appropriate illuminator. As an example we have successfully tested the “box” camera Samsung SNB-6004.

As far as “box” cameras, also “bullet” cameras may be used in some kind of installations where reading conditions are not critical. In this case we have successfully tested the “bullet” camera SNO-6084R.

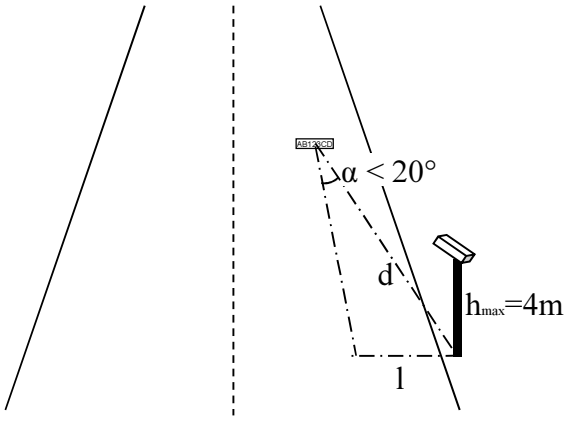
By default we consider in the following to point the cameras to rear license plates which size are normally higher than those of front plates.

As a general rule for our App, in order to read a plate of a known country, the pate width must be about ¼ of the image width. The plate image must be with good contrast and the camera must be set into b/w.



As instance, you can note the original image in the left frame and the same image successfully read by the Arteco-LPR at right: in the latter the size of the plate is ¼ of the image width.

Camera pointing line must be perpendicular (less than +/-20°) to plate plane. No plate rotation or skewing must be seen by the camera side



This specification can be accomplished with a combination of “d” and “l” as they are defined in the above figure.

For instance, if the plate read point is set at d=15 meters far from the lens, then the maximum distance of camera from the car trajectory must be l_{max} = 5,1 meters, in order to grant the α angle to be smaller than 20°. For the same reason it is recommended to keep h_{max} < 4 meters from ground.

Assumiung to use a “box” camera as the SNB-6004, in the next paragraph we describe the settings of its configuration.

Lens for “box” cameras

The correct plate size can be fitted through a proper lens setting (often a 50mm varifocal lens with IR correction is suitable) while the contrast can be achieved through a proper light.

Arteco has have successfully tested the following lenses mounted on SNB-6004:

-Fujinon YV10x5HR4A-SA2L autoiris, 5-50mm zoom with IR focus correction

- Spacecom TV555DC – IR DRACO autoiris, 5-50mm zoom with IR focus correction

License Plate lighting and embedded-IR housings for “box” cameras

In order to get the best image from reflecting-background plates, the light source must be as much closer as possible to the camera lens. The light also allows camera to read at nighttime.

An infrared light should be preferred to a visible light in order to illuminate a license plate in order to avoid driver disturbance or blinding.

An infrared band-pass filter could help the App in order to improve accuracy of plates reading.

All the above features are available in the outdoor housing designed by Arteco for this purpose and suitable for WiseNet III Samsung “box” cameras.

If the Customer’s choice is about a boxed camera (SNB-6004 for instance), Arteco can provide an outdoor housing “CAS00-LPR828” with the features detailed as below:

-power supply 110/220Vac

-10° narrow spotlight light at 850nm

-front lowpass IR filter glass

-internal PSU provides up to 500mA @ 12Vdc for supplying camera
-Maximum outer external lens diameter: 40mm

So far, we have defined specifications for “box” cameras, in particular about the lens, the illuminator and the housing. In the next paragraph we are going to deal with “bullet” cameras.

Arteco-LPR and WiseNet III “bullet” cameras

Considering the SNO-6084R among the Samsung “bullet” cameras Arteco-LPR can provide plate reading up to 10Km/h.

This device has an integrated IR light source for night-time readings which spot is designed for TVCC applications. Its embedded spot can be strenghted by an auxiliary light source mounted very close to the camera lens (less then 5cm far from). This will help in getting a more contrasted plate image while smoothing the car lights interference.

In order to preserve the image/plate width ¼ ratio, the SNO-6084R with the embedded zoom, can provide plates reading up 2,4m lens-plate distance. This achievable distance is quite short and does not allows for fit the reading angle specs (less than 20°). Because of that we have developed the function described in the next paragraph.

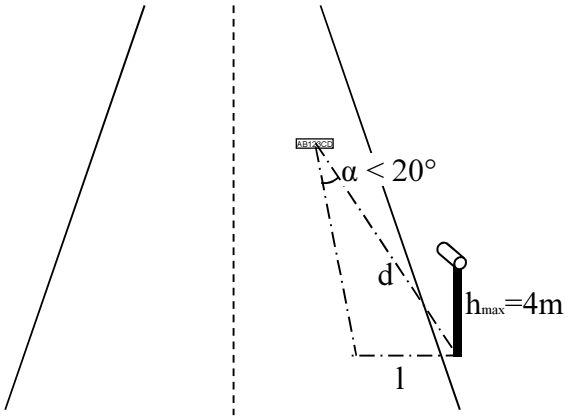
The “Crop” feature

In order to fix the small distance limit for reading plates of “bullet” lenses, Arteco has developed the “Crop” feature that enlarges the reading range. With SNO-6084R, for instance, the reading range with Crop enabled is from 5,4m minimum up to 10m maximum.

The Crop works considering just a subpart of the original image provided by the camera. This is equivalent to a digital zoom as an offset against the mechanical zoom limitations of the SNO-6084R.

As usual for Arteco-LPR it is required to set a reading point where the license plate must be as the optimal position for reading accurate. At this position no perspective distortion must be perceived by the camera and the plate symbols height must be between 18 and 25 pixel.

The crop function is provided with specific App release can be enabled/disabled installing the app proper version. With Crop version installed on SNO-6084R it will be possible to read plates in the distance range 5,4 ~ 10m, as detailed below:



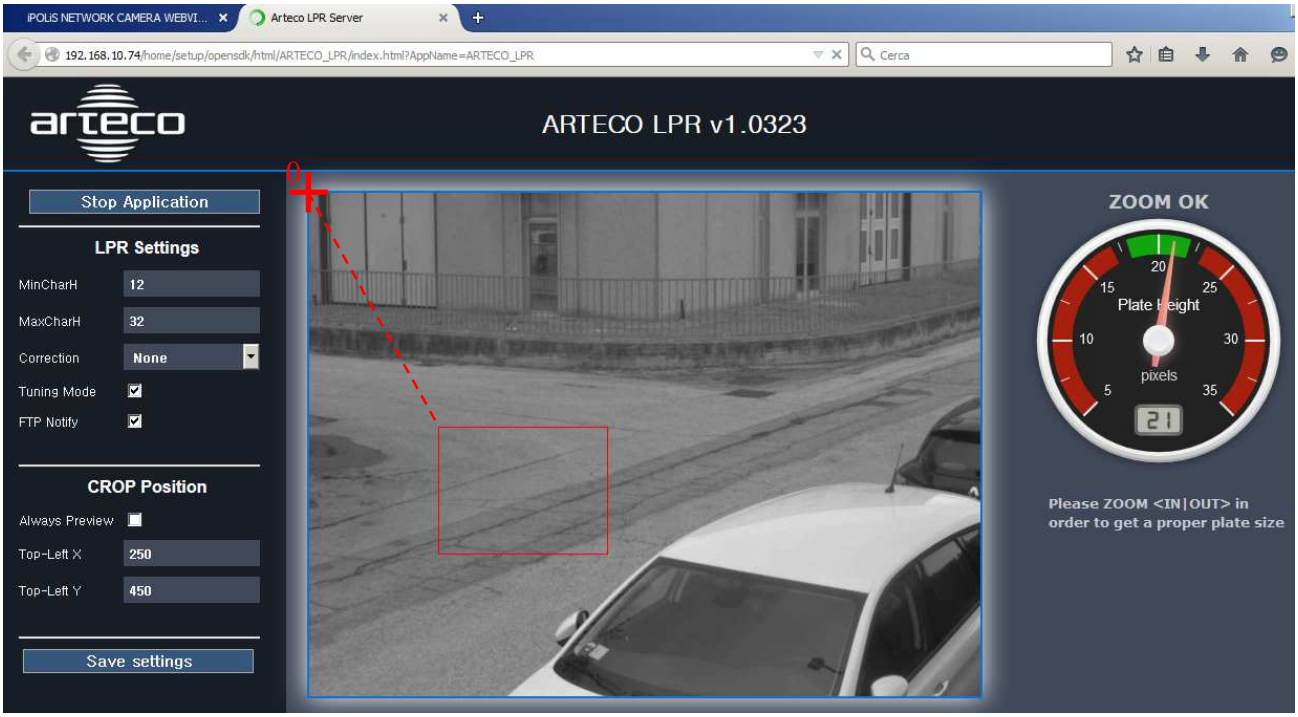
SNO-6084R: plate distance Vs. Zoom using “Crop”		
MIN-ZOOM	d = 5,4 m	l_{max} = 1,9 m
MAX-ZOOM	d = 10 m	l_{max} = 3,5 m

Zoom levels between MIN and MAX determines “d” values between 5,4m and 10m.

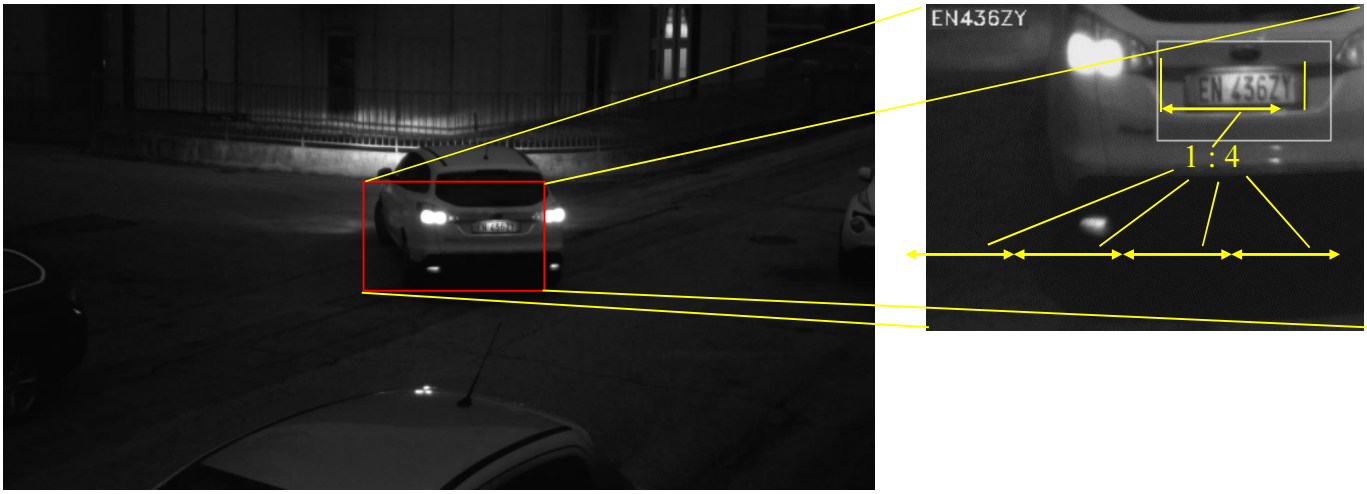
With SNO-6084R + Crop it is not possible to read beyond 10m or nearer than 5,4m

Because of what above, the use of camera with embedded zoom (like SNO-6084R) for license plate reading is suitable at very low speeds and with full compliancy of the above-described specifications.

With the Crop feature, the App interface displays a red rectangle where the plate will be read. This frame can be moved changing coordinates Top-Left X and Y, which values are referred to a zerocross, as displayed in the picture below.



In order to apply changes click on “Save settings” and the red rectangle will move accordingly.



In the above image, on the left, the Crop rectangle is displayed over the full resolution image while at the right it is displayed the crop content once there is a valid reading.

It is important to set the reading point in order to have the plate width as about ¼ of the crop width as indicated by yellow arrows in the above image at right.

Every time a plate is read, the Arteco preview window switches from whole image to read crops.

While you are positioning the rectangle over a continuous plate flow, you can stop image toggling by checking “Always Preview” and “Save settings”. This will force the whole image with the crop rectangle to be displayed continuously, although the LPR is reading plates.

The good advantage of using crop lies in allowing the camera to shoot a wide scene scope bringing all the details of what is surrounding the plate, and not just the plate.

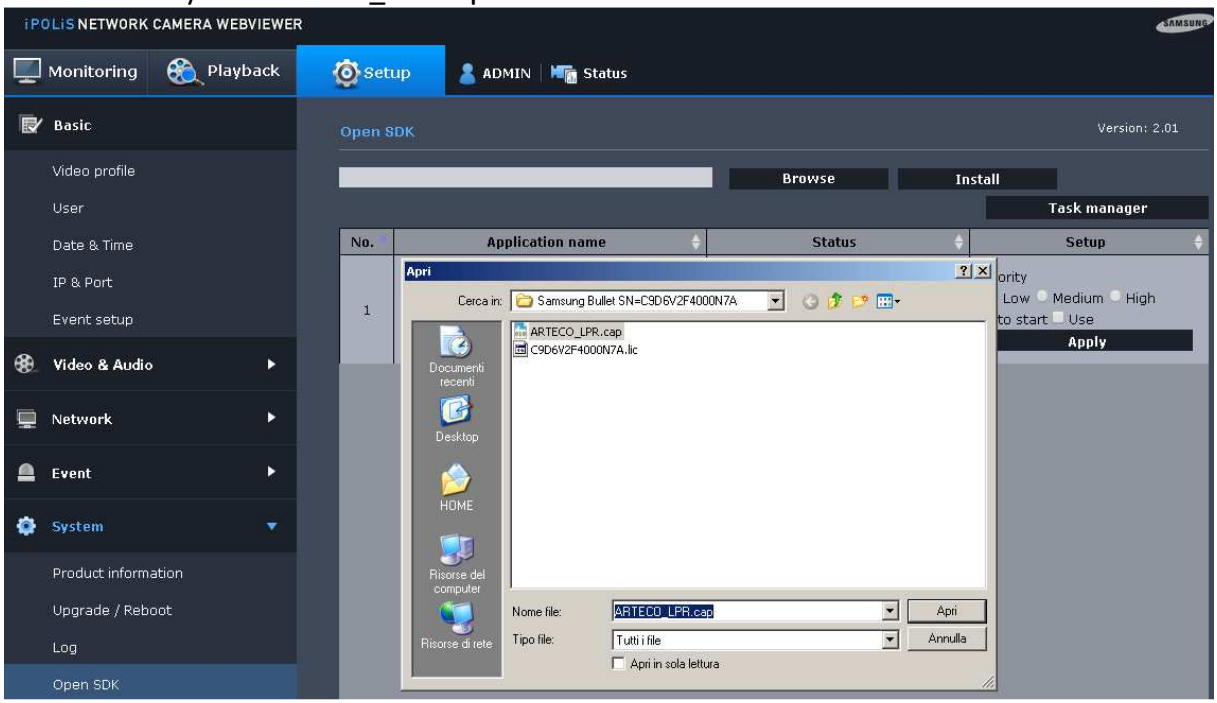
The “Crop” feature support a rough shooting setup allowing the installer to define the Crop position through the software over the plate tracks, once the hard installation job is done.

Conversely the digital zoom used by the Crop degrades the image quality and the performance of a Crop-based LPR if compared to a non cropped LPR.

Arteco-LPR app Installation and licensing

Have your Samsung Wisenet III camera firmware updated to V 3.00_140730 or above.

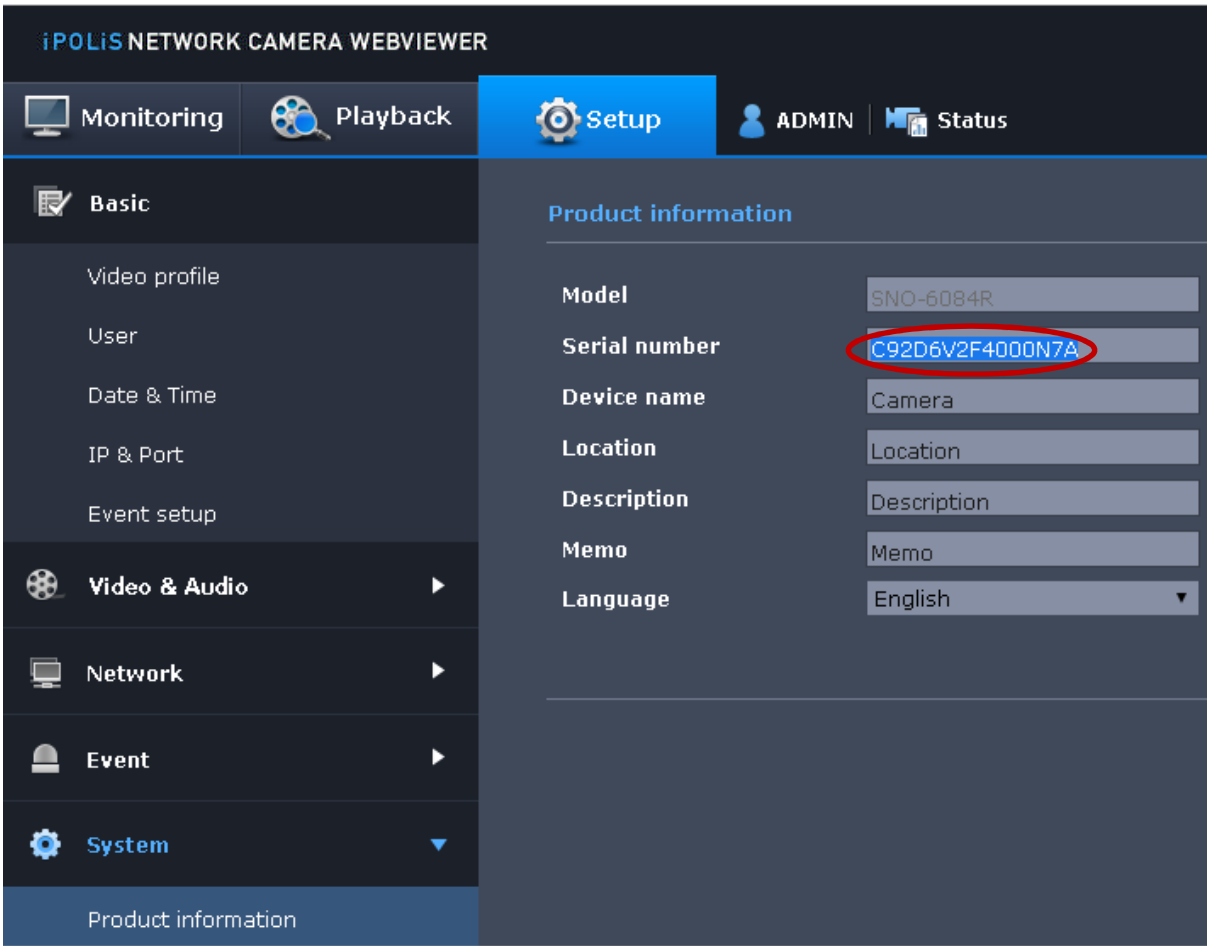
After authenticated in the camera web menu (default U:admin P:4321) goto menu System → Open SDK page and browse for your “ARTECO_LPR.cap” file as shown below:



If the “ .cap” installation package is provided with a custom name, you should rename to “ARTECO_LPR.cap” before uploading it to the camera.

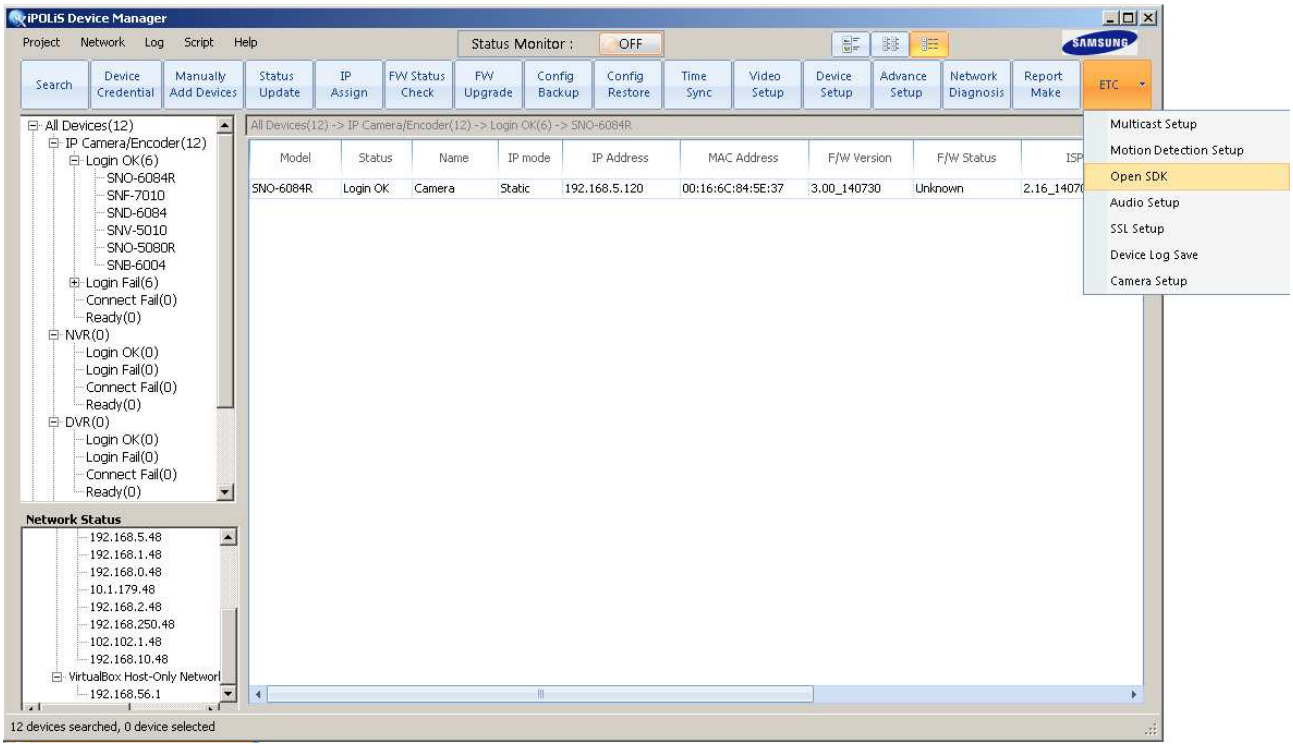
Then click Install and wait for the process completion.

In order to license the App goto System → product information and copy the camera S/N

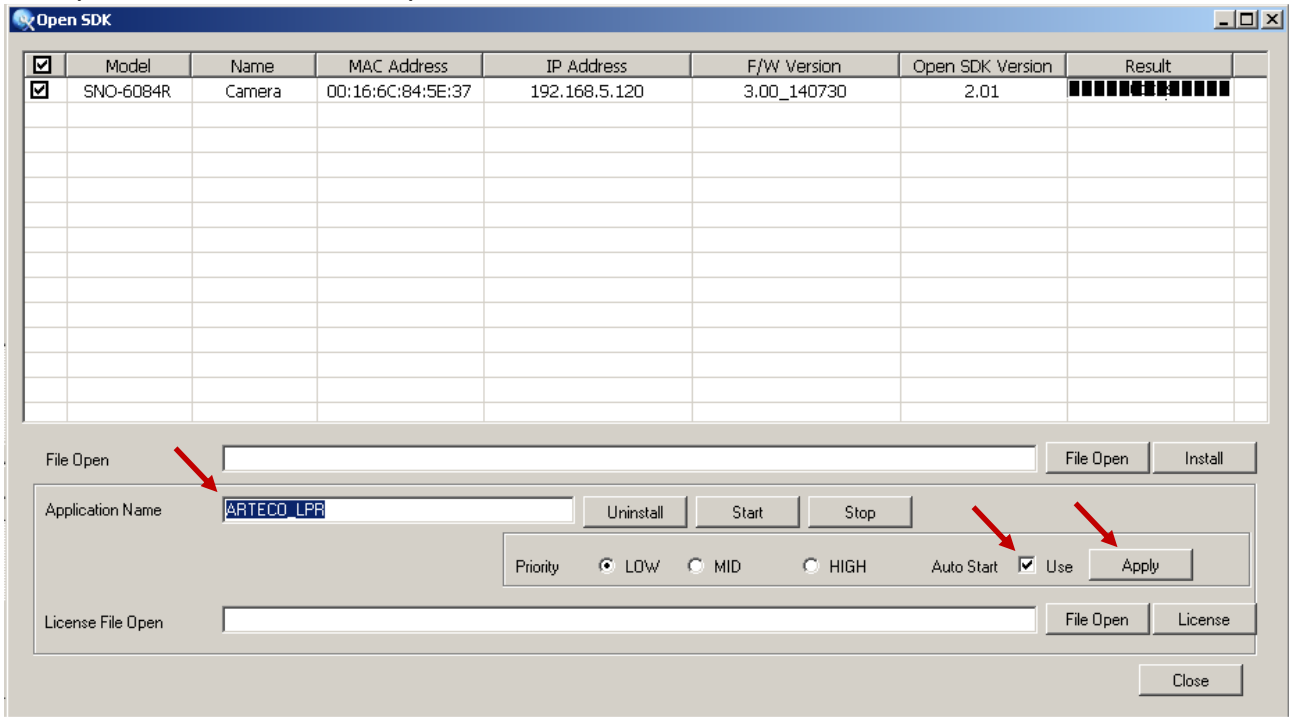


In the above example get the code “C92D6V2F4000N7A” and send it to your Arteco dealer which will reply soon with related license file which name will be “<yourserial>.lic”

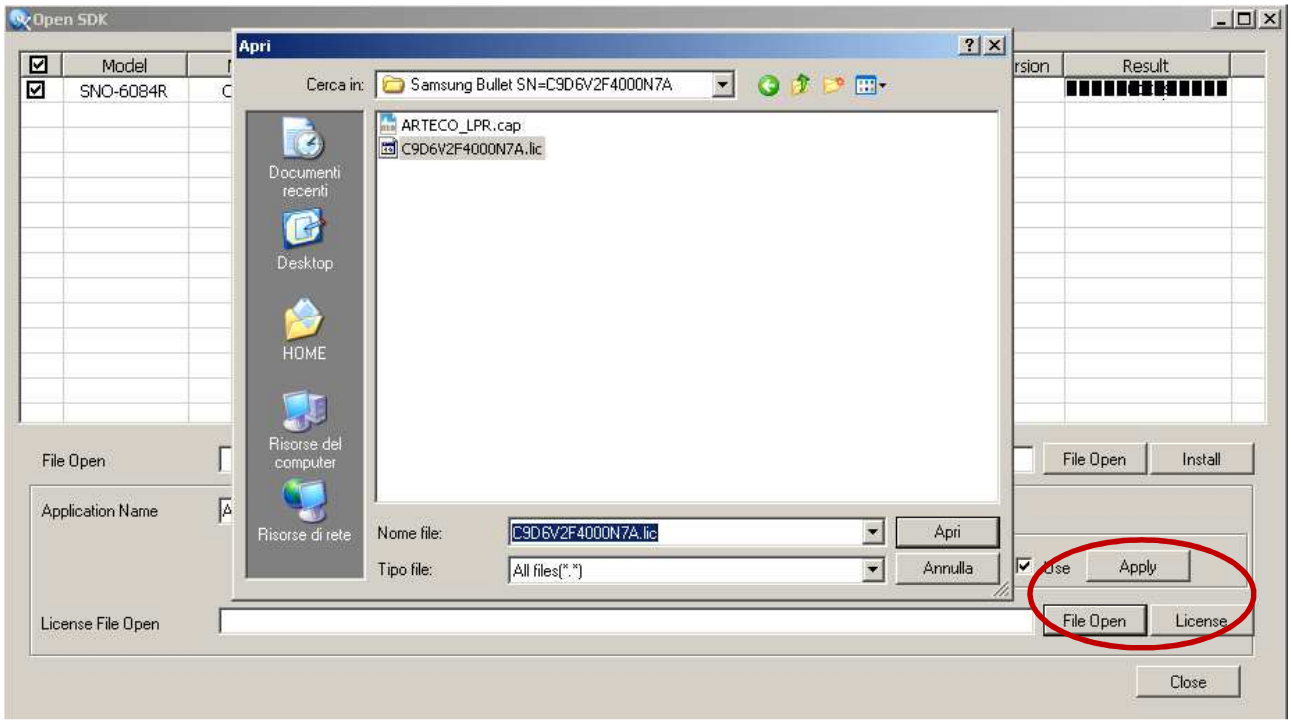
In order to upload the license file download from Samsung the iPolis Device Manager (iPOLiS_Device_Manager_v1.12.0_setup_Full.exe), search and authenticate to your Samsung camera then click on ETC → OpenSDK menu



This will open a custom menu for Open SDK.



Type the application name “ARTECO_LPR”
Check the “Auto Start” flag and click “Apply”.



Then click on File Open, browse for license file "<yourserial>.lic" and click on "File Open" and then click on "License".

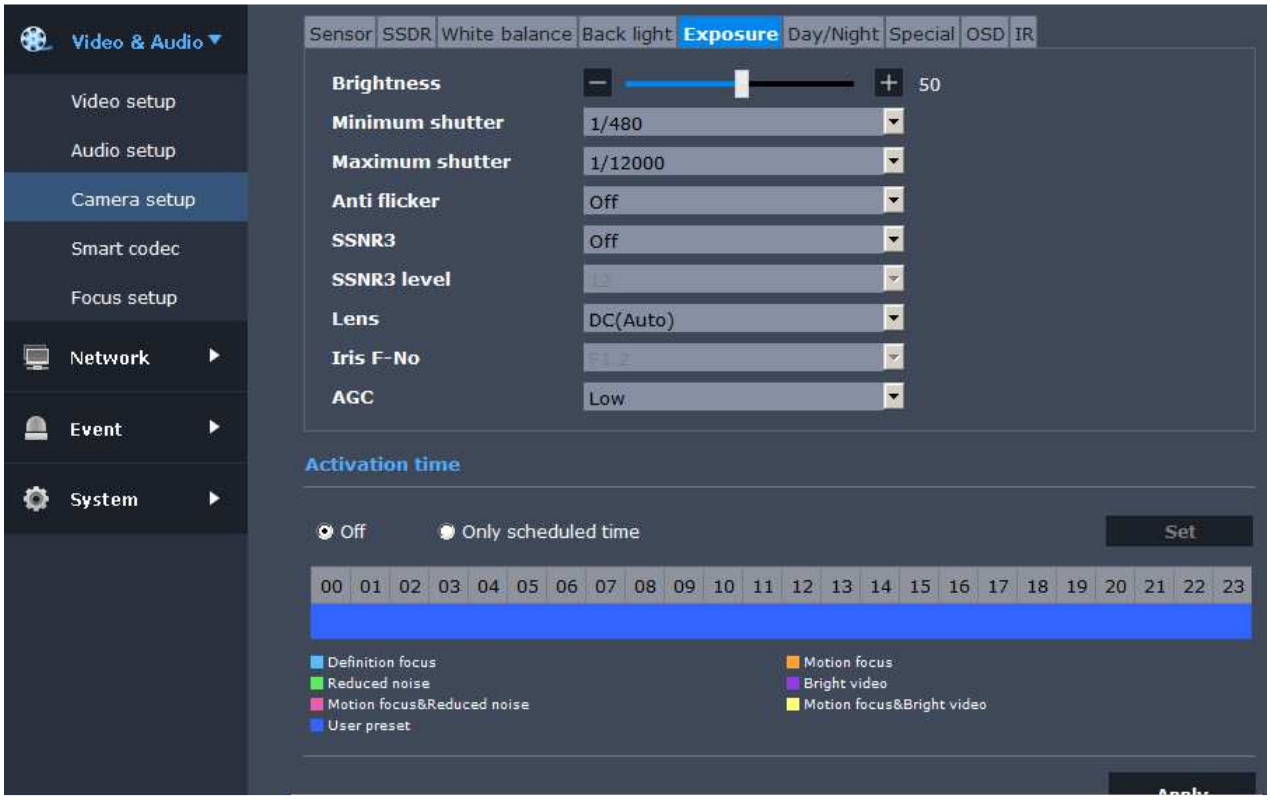
Samsung camera configuration

The WiseNet III series Samsung Techwin cameras, allows for saving typical presets of parameters for different environmental conditions.

Some examples suitables for most common situations are shown in the following table:

PRESET NAME	MIN SHUTTER	MAX SHUTTER	AGC	SSDR	SSNR
Focus set definition (default)	1/5	1/12000	High	12	12
Focus set in motion	1/30	1/12000	High	12	4
Noise reduction	1/15	1/12000	Medium	12	12
Sharp Video	1/5	1/12000	High	18	12
Focus set in motion + Noise reduction	1/30	1/12000	Medium	12	4
Focus set in motion + Sharp Video	1/30	1/12000	High	18	4

These parameters can be found in the camera browser interface clicking on menu "Setup" → "Video & Audio" → "Camera Setup":



For shooting moving license plates it is good to increase the shutter speed and to smooth SSNR and AGC aiming to get the best image suitable for allowing the Arteco LPR app to read plate characters.

The optimal features for the software are: B/W license plate, well contrasted characters against to plate background and mimimum character height 10 pixels.

It is also needed to set “Day & Night” to “B/W”. If the plate is properly illuminated we can set the camera as followns:

-Min shutter speed: 1/500, (max: 1/12000)
-SSNR level: OFF
-AGC: Low

If with the above parameters the image is too dark it is better to increase lighting or you can even try to reduce shutter speed:

-Min shutter speed: 1/120 (max: 1/12000)
-SSNR level: 4 44 4
-AGC: Medium

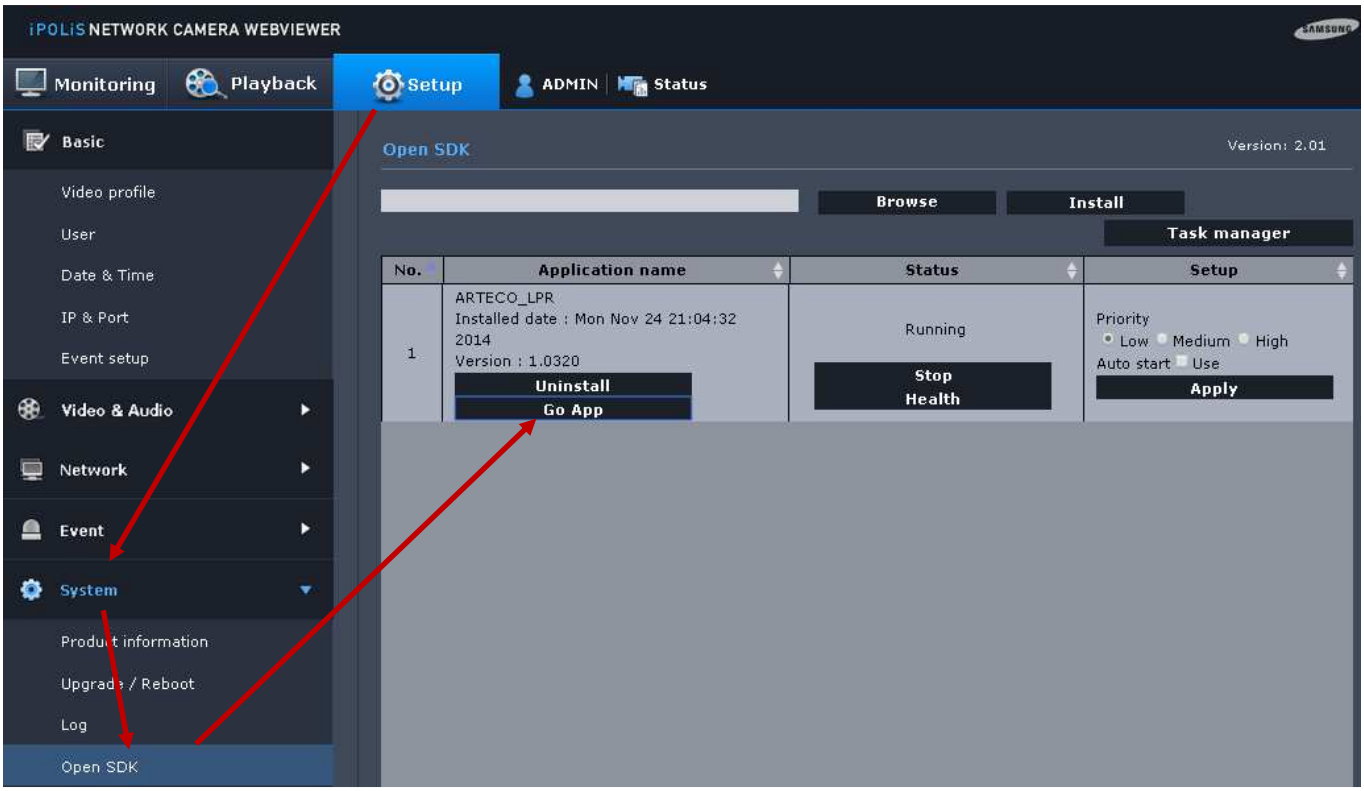
Video profiles

In the video profiles menu you will find a custom profile labelled as “OPENSDKMJPEG” and created automatically by “Arteco-LPR”. This profile is used by Arteco LPR App for license plate reading and for display the plates in the preview web page

Access to Arteco LPR display page

Connecting to the Samsung IP via Web browser web (Firefox Mozilla is the most suitable but a good image fluency can be provided also by Google Chrome), you can watch the Arteco-LPR app preview at URL:

http://<Camera_IP_addr>/home/setup/opensdk/html/ARTECO_LPR/index.html?AppName=ARTECO_LPR



The same page can be reached from camera main menu by clicking Setup → System → Open SDK → Go App, as pointed out in the above image.

In the image below there is a snapshot of the Arteco-LPR preview page.

When a plate is read the app draw a rectangle surrounding the plate and writes the plate in the image corner as shown below:

Lens zoom tuning

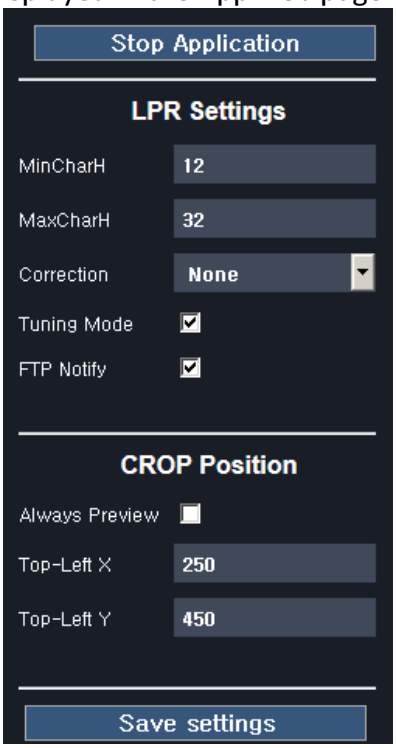
By seetting on “tuning mode” a gauge appears at the right side:

This tool allows the Installer to understand if plate is too big or small for optimal reading.

Real time measure of the actual plate height in pixel, drives the gauge indication in order to suggest the installer whether zoom-in (if plate size is too small) or zoom out (as in the above example) if plate size is too big.

Set lens focus properly, minimize camera rotation and skew and point the camera to plate perpendicularly (+/-20°).

The following parameters are displayed in the App web page:



"MinCharH" means minimum char height [pixel]
"MaxCharH" means maximum char height [pixel]

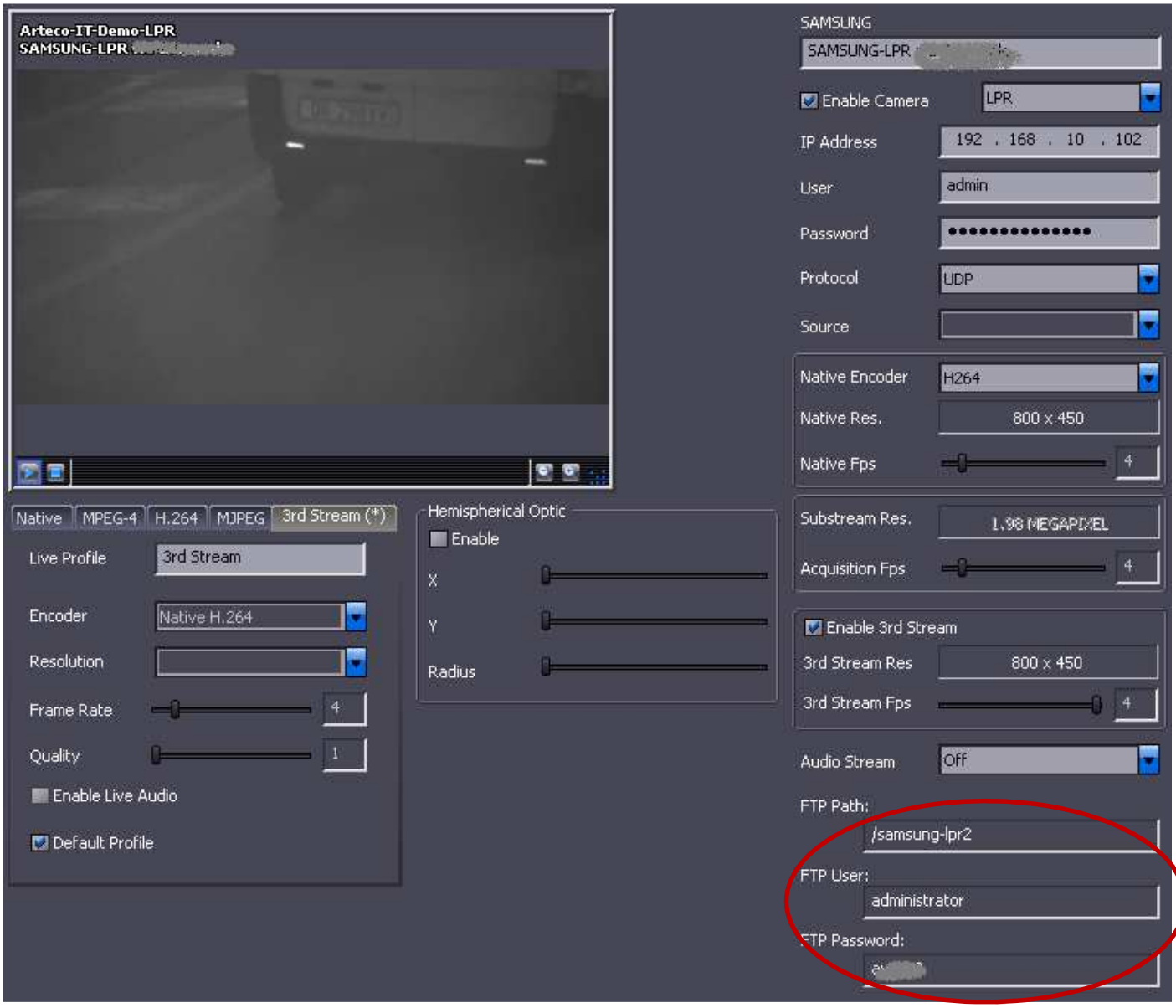
You can change these parameters if your lens does not allows for sizing the plate as ¼ of image width. Minimum acceptable height for a plate letter/number is 15 pixels.

After changing parameters click on "Save Settings".

Connecting to Arteco Server

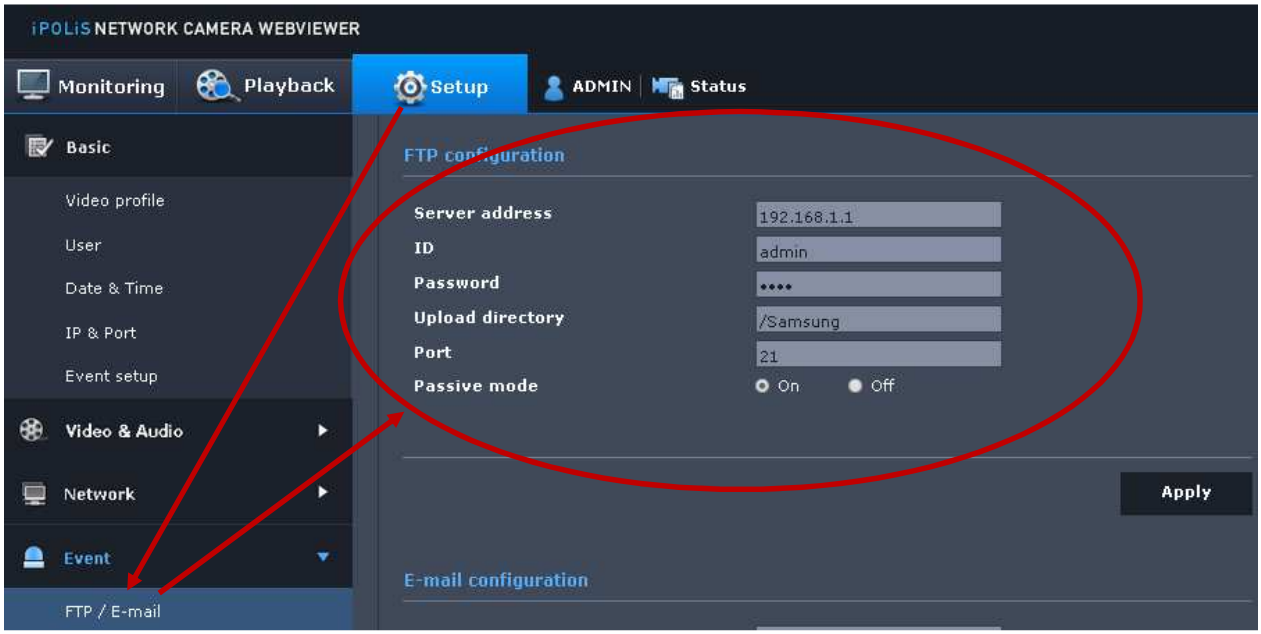
In order to manage a read plate archive you can use Arteco NEXT.

To do so it is required to save the credentials displayed in the Arteco interface and apply the credentials to camera menu.

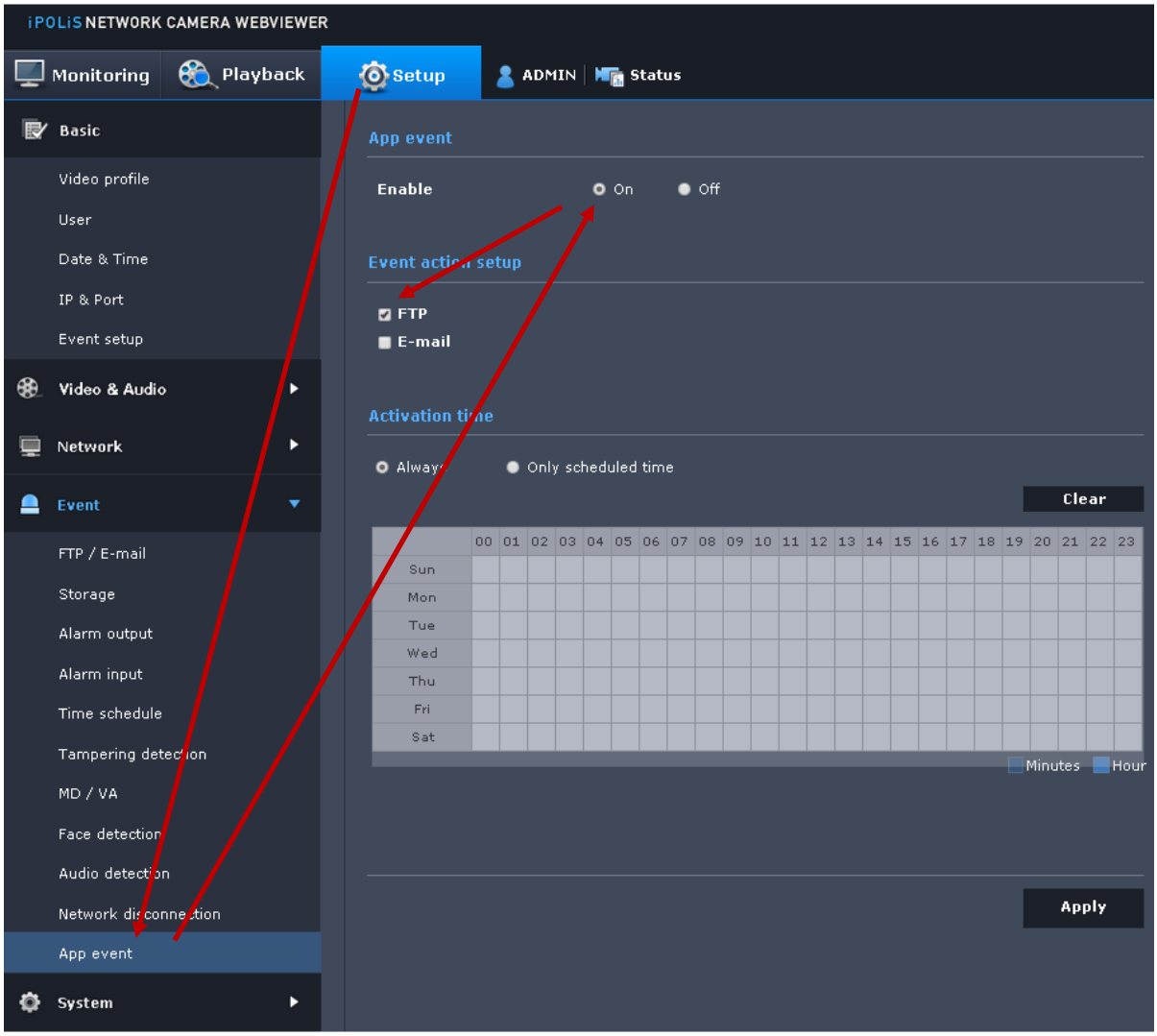


The parameters surrounded by red area must be used in order to configure the FTP client of Samsung camera as described in the next paragraph.

In order to transmit the license plates data from Samsung camera into “Arteco NEXT” you have to configure the Samsung Setup → FTP/E-mail menu with the Arteco-Server address and credentials. The image below gives an example on how to configure these parameters:



Then you have also to set “FTP Notify” in order to enable image file sending through the camera FTP client that can be configured from menu Setup → Event → FTP/Email as shown below:



After every check is done then click on “Apply”.

Features of Arteco LPR App

Below we report the main features and performance obtained with optimal shooting conditions:

-Country of known plates: Albania, Austria, Bulgaria, Czech Republic, Denmark, Estonia, France, Greece, Hungary, Italy, Latvia, Lithuania, Moldova, Montenegro, Holland, Poland, Romania, Slovakia, Slovenia, Spain, San Marino, Sweden (new plates), United Kingdom.

For some countries, a training period could be requested by Arteco to maximize performances.

-Max distance lens to plate: 15m for box camera with 50mm lens; from 5,4m to 10m for bullet cameras with embedded 3~9mm varifocal lens.

-Max vehicle speed: 50km/h for box camera with proper lens and lighting, 10km/h per bullet cameras with embedded lens and lighting

-Max plate rate reading: 1 plate every 2 secs