HIKVISION EUROPE

SOLUTIONS

[ANPR Solution]

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ANPR System & Products
Brief Description of System
Application: Small Parking System **Composition**: depending on different application scenario requirements, three solution architecture modes are available for selection: **IPC+SDK**, **NVR+ IPC**, and **NVR+ IPC+ Surveillance Center**. Each mode is with functionalities of ANPR recognition, storage, querying and backup. Please refer to Solution chapter.
Reference
● *Datasheet of DS-2CD7026G0/P-(AP) Camera* ● *Datasheet of NVR (K and I series)*

Revision History

No.	Revised Content	Time	Revised by	Reviewed by
1	V0.8	2015/8/31	Ric, Challen	Ethan
2	V0.9	2015/9/9	Challen	Ethan ,Ric
3	V1.0	2015/9/29	Challen	Ethan
4	V1.2	2018/5/30	Kelsen Zhang Peter.Yang	Ronny.Lin
5	V1.3	2018/6/8	Joyce Zhou	Ethan Qu
6	V1.4	2018/7/2	Joyce. Zhou	Ethan. Qu

Chapter 1 Overview

1.1 Background

Due to the rapidly growing vehicles, automated parking systems with video surveillance is significantly important for security and efficiency consideration. As license plate is the unique ID for each vehicle, it's important to recognize it in some parking related scenarios like public garage, gas station, hotel, supermarket, and so on. In this way, all the vehicles are recognized and protected without any change inside the vehicles.

1.2 Overview

The Automatic Number Plate Recognition (ANPR) System can be used to recognize the license plate of vehicles and capture the images. The captured license plate images and video can be stored or uploaded to NVR/Server for further analysis and query.

Figure 1-1 ANPR Processing Diagram

1.3 Key Features

Comparing with other ANPR system, the Hikvision ANPR system has the following advantages:

- Embedded ANPR algorithm designed in the cameras;
- Accurate capture and accurate recognition;
- Bullet camera is with build-in infrared light, adaptive to even low light environment;
- Simple construction for easy installation in public areas;
- Easy to operate;
- Convenient system expansion and renovation via network configuration and new cameras adding.

Chapter 2 System Deployment

The system mainly consists of the following three components: camera, NVR and iVMS.

Camera
- Recognize and capture picture
- Recommended: DS-2CD7026G0/P-AP series DeepinView camera

NVR
- Live view, record and backup of the vechile video and pictures; searching license plate, managing W/B list, statistics of vehicle's entrance and exit time, etc.
- Recommended: DS-9600/7700/7600NI-K/I series NVR

IVMS
- Manage devices; view of live video and license plate pictures; backup and query
- iVMS-5200, HikCentral

Refer to the following diagram for the data processing flow:

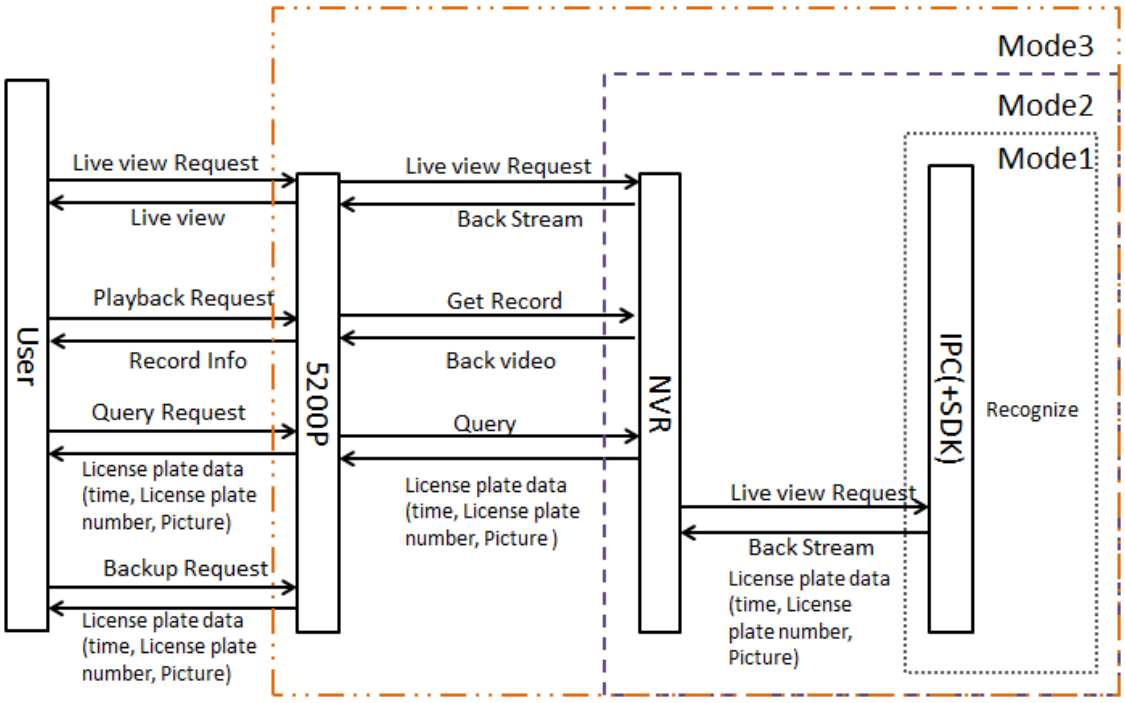


Figure 2-1 ANPR Data Processing Flow

Chapter 3 Solution

3.1 Solution Architecture

Depending on different application scenario requirements, three solution architecture modes are available for selection: **IPC+SDK**, **NVR+ IPC**, and **NVR+ IPC+ Surveillance Center**.

- **IPC+SDK** (Mode 1)**:** Use ANPR camera with other SDK, providing excellent system integration and extension with the 3rd party software.
- **NVR+ IPC** (Mode 2): Convenient to manage and operate the devices in the system with high performance and cost effective.
- **NVR+ IPC+ Surveillance Center** (Mode 3): Easy to operate with the iVMS platform. Suitable for the large-scale solution scenario requirement.

Refer to the following topological map:

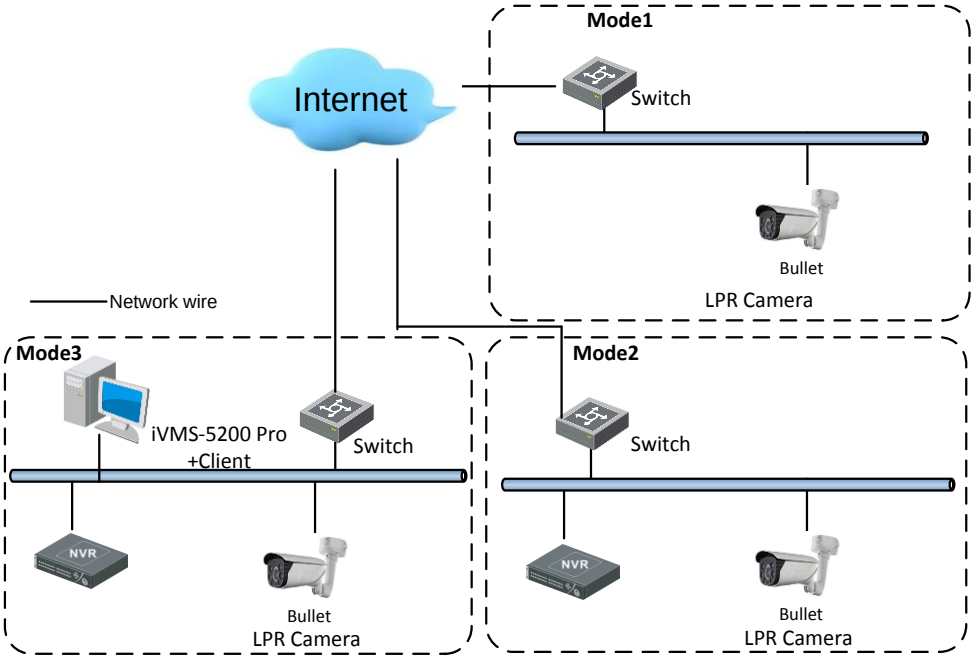


Figure 3-1 Topology of ANPR System

3.2 ANPR IPC+SDK

3.2.1 Description

Specific models of Hikvision IP cameras are embedded with ANPR algorithm. We can achieve high-accuracy capture and recognition rate through recommended installation, and the 3rd party company can easily integrate ANPR functions through Hikvision SDK.

Refer to the following figure for the system integration.

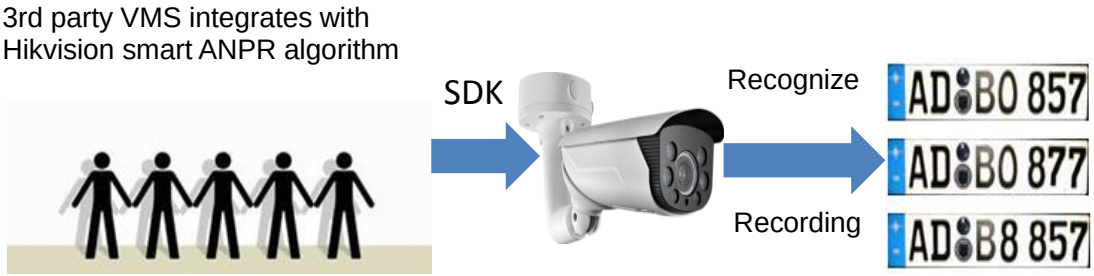


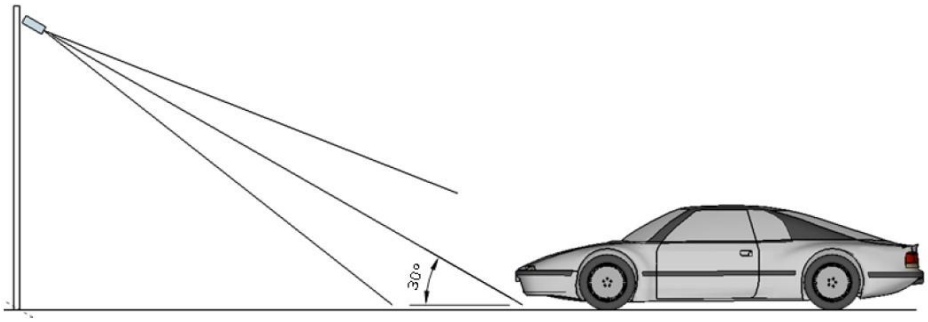
Figure 3-2 ANPR IPC+SDK System Diagram

3.2.2 Camera Mounting

Based on the view angle and the IR distance of your camera, install the camera at a proper height and distance.

The view angle of the camera should be within 30 degrees to the ground.

Vertical angle should not exceed 30 degrees.

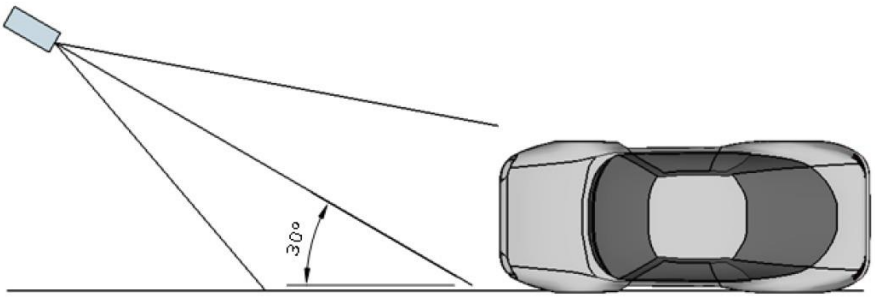


The view angle of the camera should be within 30 degrees to the path of movement. Horizontal angle - should not exceed 30 degrees.

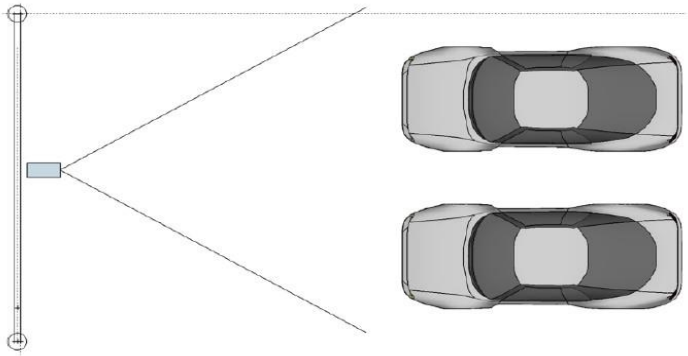
The installer can measure all of the needed geometrical lengths using a Pythagorean equation.

I am assuming the height of camera mounting (let it be *x*), and the distance from the camera to the vehicle by the ground (let it be *y*), then the formula is: y = (square root of 3)*x = 1.7 * *x*

Example: If *x* = 3 meters, the minimum distance *y* must be bigger than 5.1 meters.



Install the camera to the front of the vehicle (recommended). If you want to recognize two lanes, it is generally recommended to mount a camera on a crossbar.



3.2.3 3rd Party VMS Integration

Hikvision supplies the APIs such as: picture searching, LPR configuration, intelligent control configuration ability, get/set intelligent control parameters APIs, and plate recognition alarm uploading.

3.2.4 Configuration

Configure Vehicle Detection

Before you start:

- Upgrade the firmware to the specific firmware. The camera has to be connected to local network.
- VCA resource can be efficiently allocated to get a better performance. Two modes of VCA resource allocation are supported simultaneously: Smart Event and Vehicle Detection.

Step 1 Access the camera via Web browser and log in with the administrator account.

Step 2 Go to **Advanced Configuration**->**Road Traffic**.

Step 3 Select the detection type to **Vehicle Detection**, and check **Enable**.

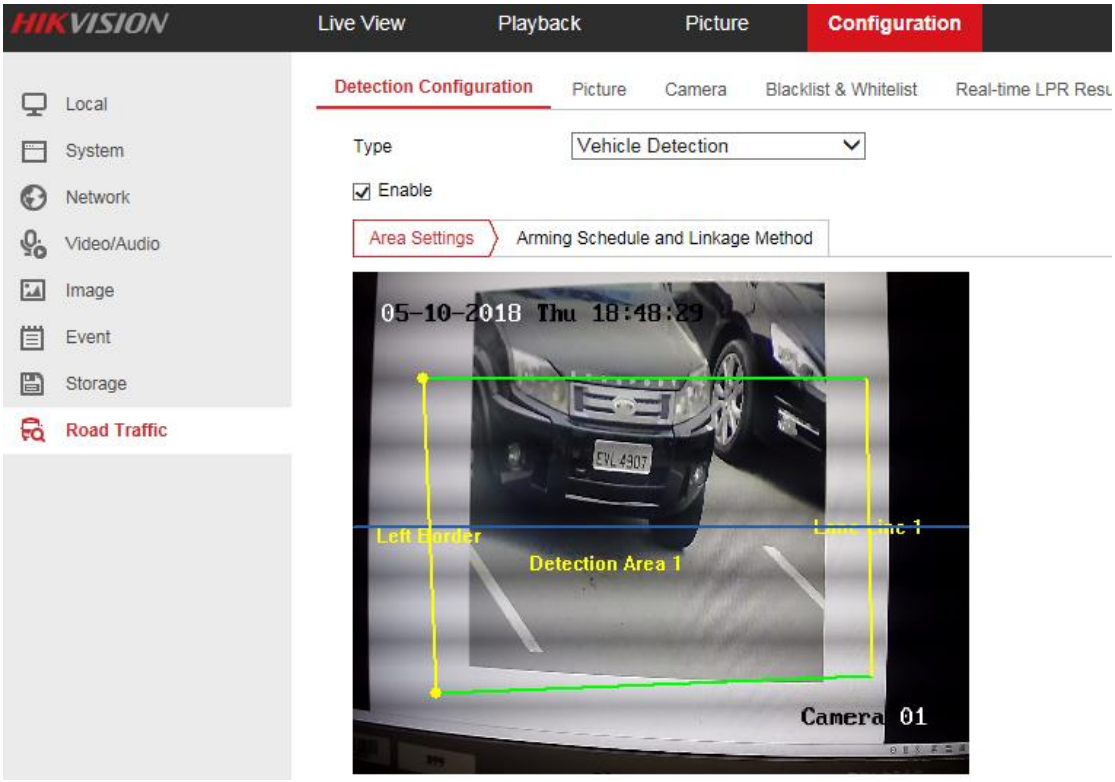


Figure 3-3 Enable Vehicle Detection

Step 4 Select the lane number in the corresponding dropdown list. Up to 4 lanes are selectable. To get the best result, one lane or two lanes are recommended.

Step 5 Click and drag the lane line to set its position, or click and drag the line end to adjust the length and angle of the line.

NOTE

Only 1 license plate can be captured at one time for each lane.

Step 6 Adjust the capture trigger line to a proper position.

NOTE

The capture trigger line is suggested to be drawn in the middle of the detection area.

Step 7 Select the plate mode, region and scenario mode from the dropdown list.

Large: The height of a license plate should be 20 to 30 pixels in the image captured by a 2MP resolution camera.

Small: The height of a license plate should be 30 to 40 pixels in the image captured by a 2MP resolution camera.

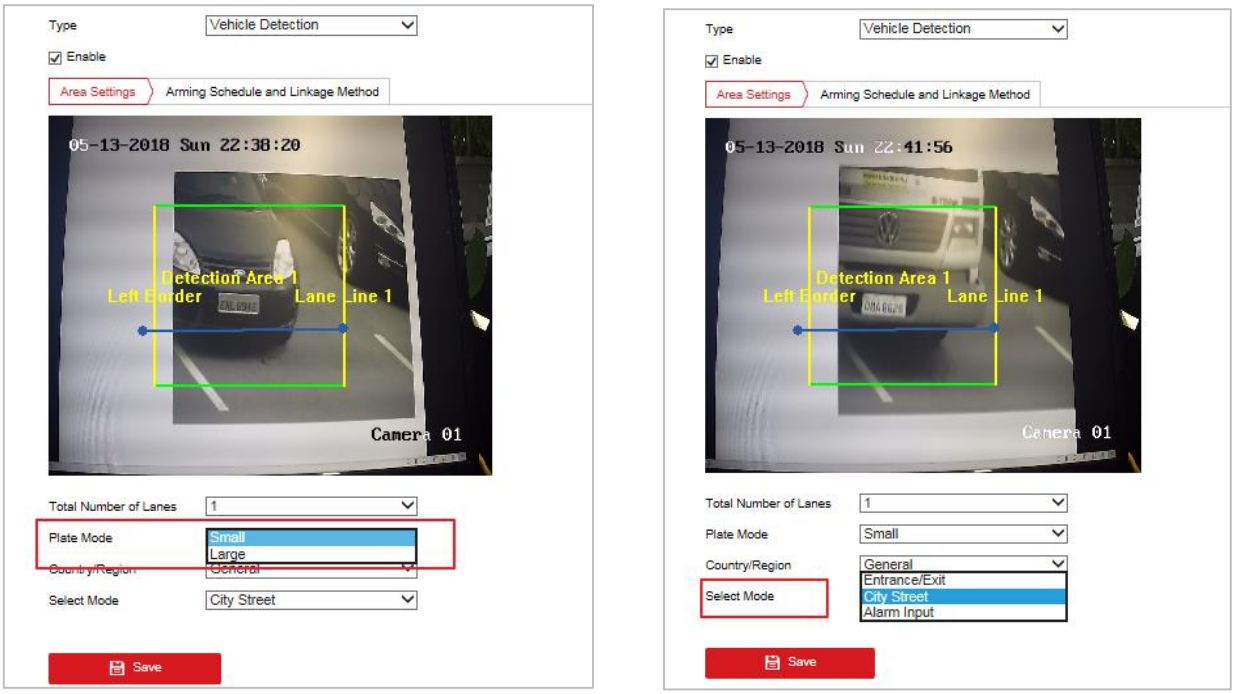


Figure 3-4 Select Plate Mode, Region and Scenario Mode

Step 8 Set the arming schedule for different license plate list type (White list, Black list or Other list).

Figure 3-5 Set Arming Schedule

Step 9 Select the alarm linkage methods.

- Three direction types are selectable: **All**, **Forward** and **Reverse**.

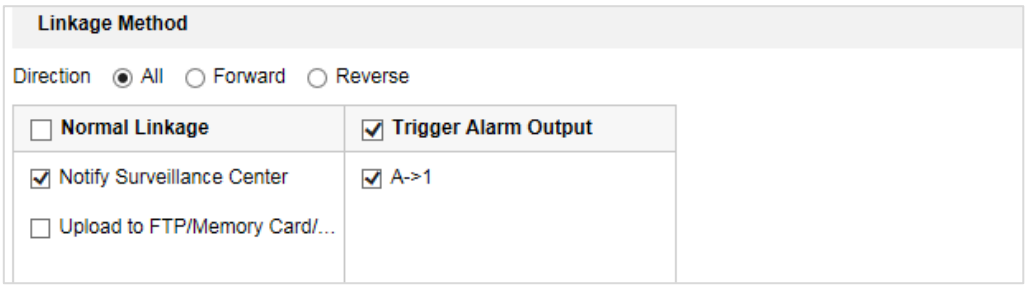


Figure 3-6 Set Alarm Linkage Method

- Notify Surveillance Center

Send an exception or alarm signal to NVR/ remote management software when an event occurs if you need to check in the Surveillance Center.

- Upload to FTP/ Memory Card /NAS

Alarm information will be uploaded to configured FTP server, NAS, or on-board memory card.

- Trigger Alarm Output

Alarm signal will be sent to a configured device which will take certain actions to the received signal.

Step 10 Click **Save**.

Enable Real-Time LRP Result

You can view the real-time license plate image and information via Web browser.

Step 1 Go to **Configuration**->**Road Traffic**->**Real-time LPR Result**

Step 2 Check **Enable Real-time LRP Result**.

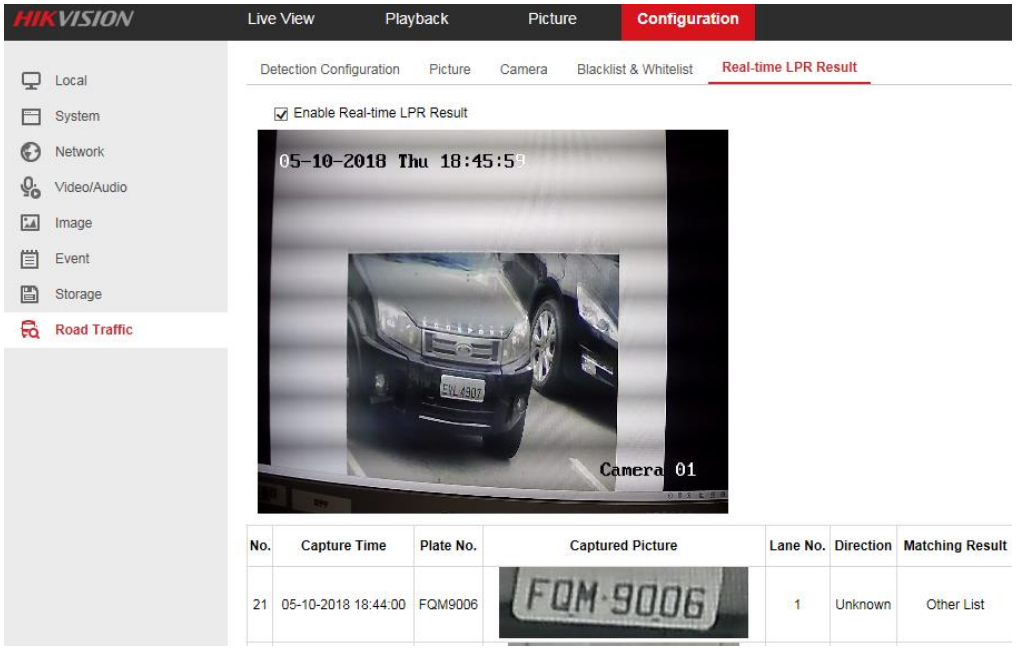


Figure 3-7 Real-Time License Plate Image

Set Image Parameters

Step 1 Go to **Configuration**->**Image**->**Display**

Step 2 Configure the image settings. We recommend the following parameters:

Backlight	BLC Area	OFF
	WDR	OFF
Exposure	Iris Mode	Auto
	Auto Iris Level	50
	Exposure Time	1/1000
	Gain	20
Day/Night Switch	Day/Night Switch	Auto
	Sensitivity	4
	Filtering Time	5
	Smart IR	ON
	Mode	Auto

Step 3 Click **OK**.

Result:

Figure 3-8 LPR in Daylight and Nighttime

Set Picture Text Overlay

The captured license plate picture can be overlaid with the picture information such as the camera No. plate No. capture time, etc.

Step 1 Go to **Configuration**->**Road Traffic**->**Picture**

Step 2 Configure the overlay text parameters, e.g., font color, text content, etc.

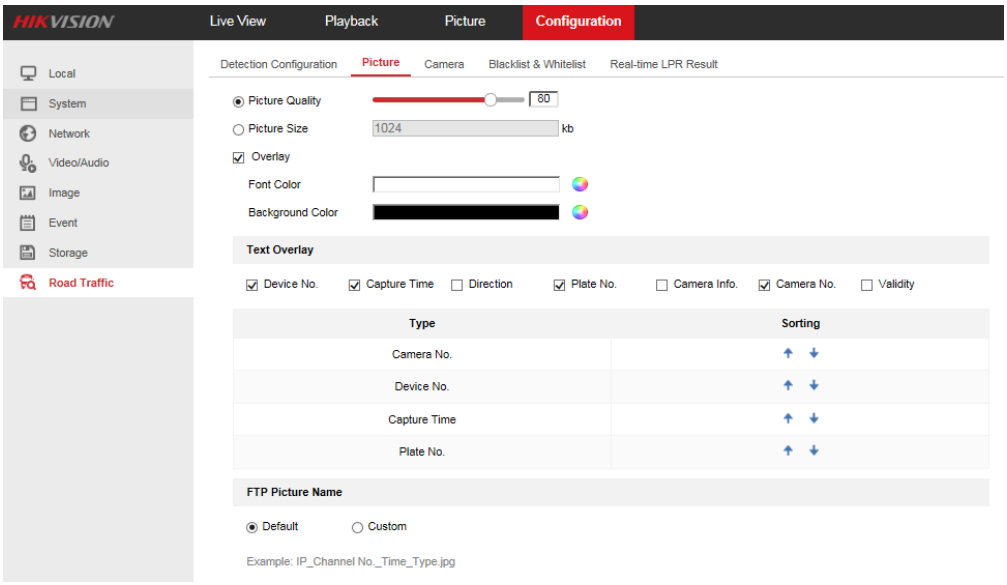


Figure 3-9 Picture Text Overlay

3.2.5 Product Selection

We recommend the following products for use in the solution.

Table 3-1 Product List

Product	Product Model	Description	Image
DeepinView	DS-2CD7026G0/P-AP	1/1.8" Progressive Scan CMOS; 1920 × 1080 @ 60 fps; 140dB WDR; License Plate Recognition; 6 behavior analyses, 2 exception detection	

* For detailed information, please refer to the datasheet of DS-2CD7026G0/P-AP.

3.3 NVR+IPC

3.3.1 Description

As NVR does not support algorithm identification locally, it should be used with the ANPR camera in this solution mode which is connected to a LAN deployment.

Figure 3-10 NVR+IPC Solution Mode

3.3.2 Configuration

NOTE

The LPR detection can be configured and managed via local GUI or Web browser of NVR. The following section describes the configuration on local GUI, which can be also for reference for the configuration on Web browser.

Configure LPR on NVR

Step 1 Go to **Camera** ->**IP Camera** to add the ANPR camera into the NVR.

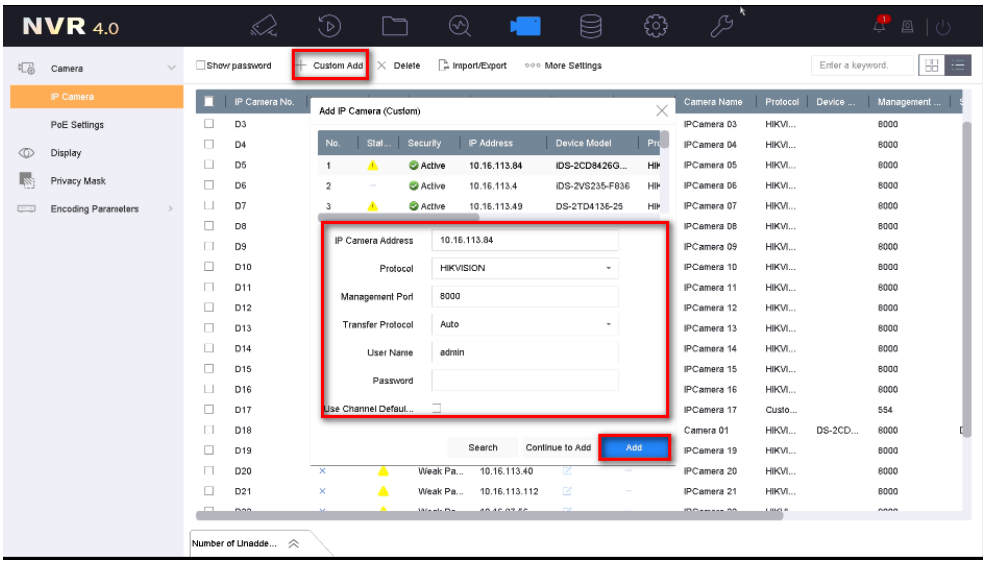


Figure 3-11 NVR+IPC Solution Mode

Step 2 Go to **System**->**Event**->**Smart Event**->**Vehicle** to enable **Vehicle Detection** and select the **Lane Number.**

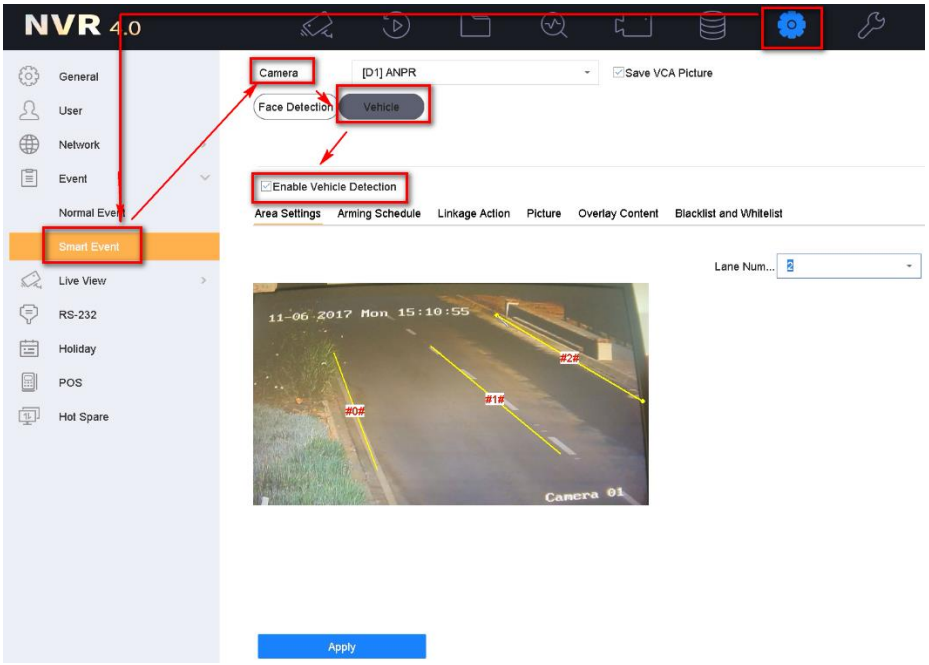


Figure 3-12 Enable Vehicle Detection

Step 3 Go to **System**->**Event**->**Smart Event**->**Vehicle**->**Picture** to configure the picture parameters including the picture quality, text overlay, picture character overlay, etc.

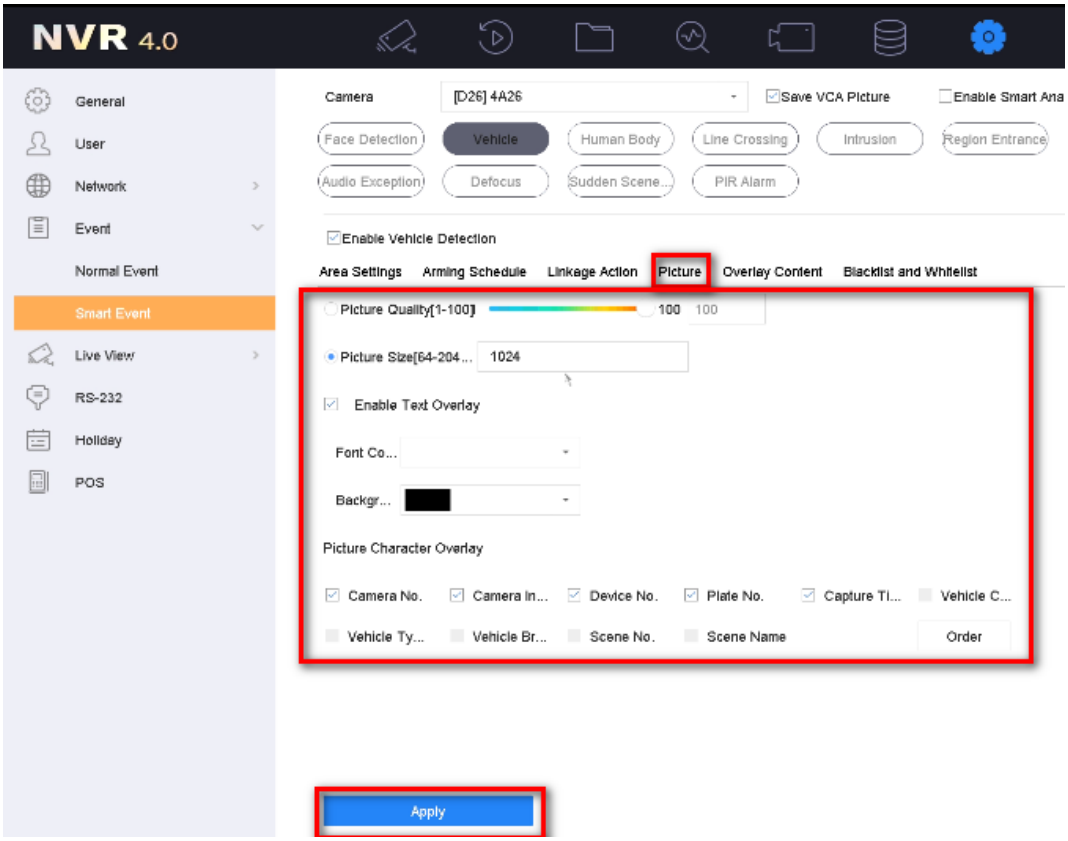


Figure 3-13 Picture Parameters Configuration

Step 4 Go to **Vehicle**->**Linkage Action** to configure the **Trigger channel/Arming Schedule** and set the **Linkage Action** for both blacklist and whitelist.

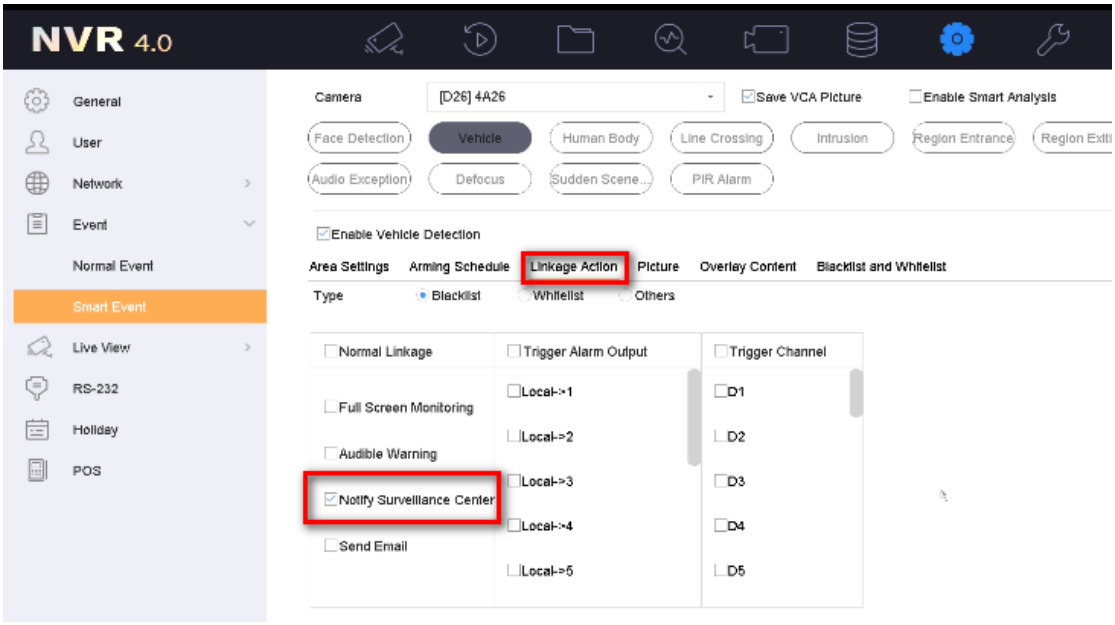


Figure 3-14 Set Alarm Linkage Action

Manage Blacklist and Whitelist

Import the Backlist & Whitelist

Step 1 Edit the blacklist and whitelist on computer, and copy the file to a USB storage device.

	No	Plate Num	Group(0 black list, 1 white list)
2	1	D7S1411	0
3	2	D7A1411	1
4	3	D71411	0
5	4	D7Q1411	1
6	5	D71411	0
7	6	D7R1411	1
8	7	D7Q1411	0
9	8	D741411	1
10	9	D7961411	0
11	10	D71411	0
12	11	D7A1411	0
13	12	D7S1411	0
14	13	D71411	0
15	14	D7Q81411	0
16	15	D7A1411	0

Figure 3-15 Edit Blacklist and Whitelist

Step 2 Connect the USB storage device to the NVR. Go to **Event**->**Vehicle**->**Import** to import the blacklist and whitelist as follows.

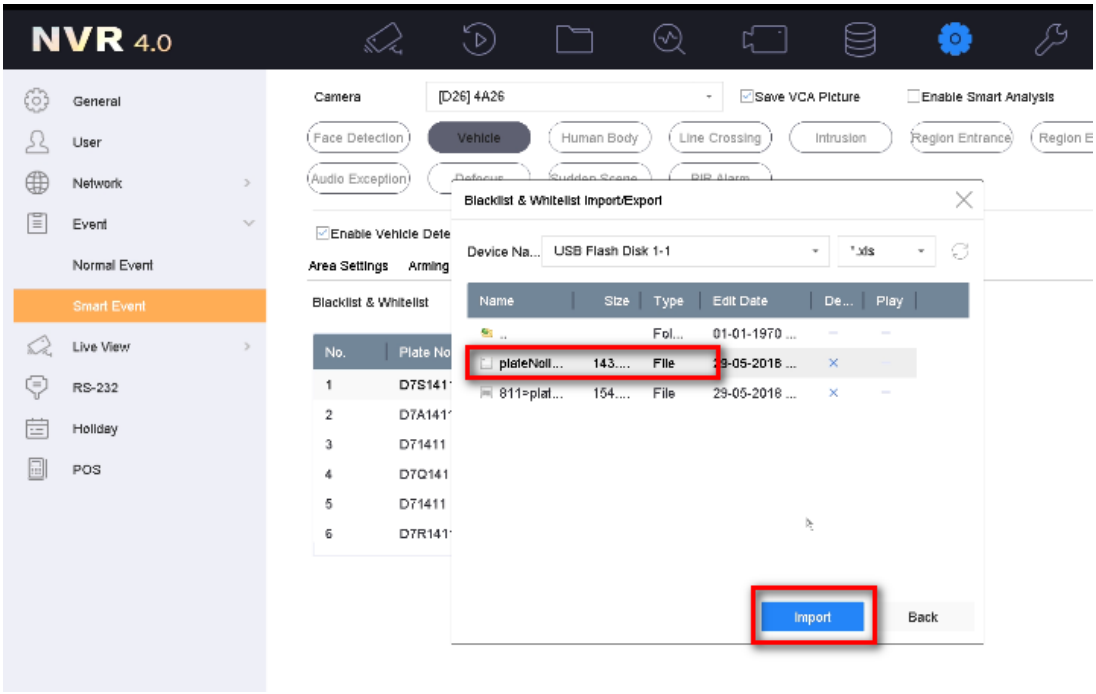


Figure 3-16 Import Blacklist and Whitelist (1)

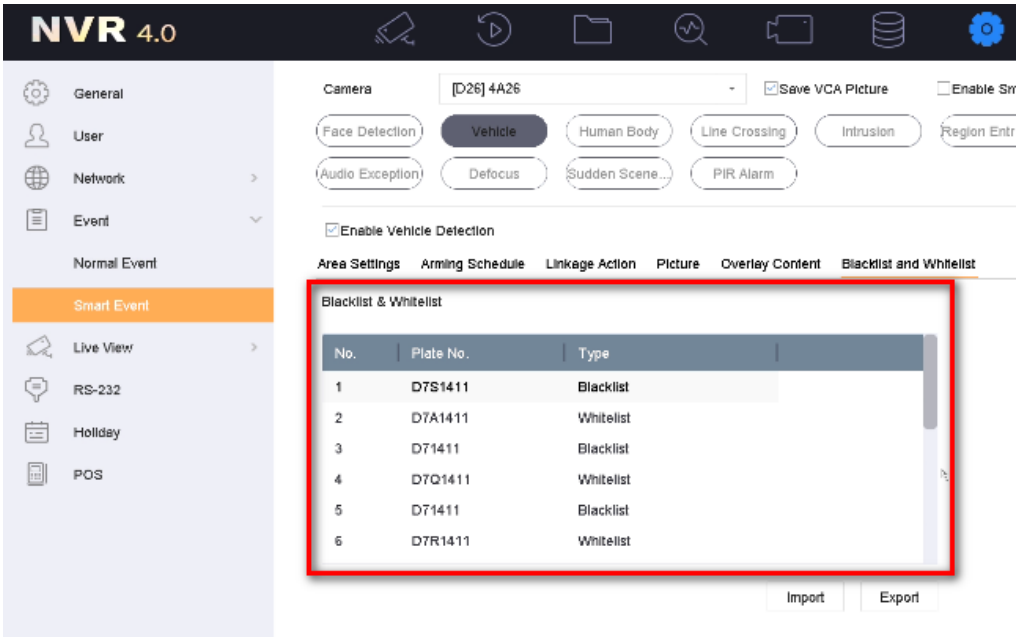


Figure 3-17 Import Blacklist and Whitelist (2)

Export the Backlist & Whitelist

Step 1 Connect the USB storage device to the NVR. Go to **Event**->**Vehicle**->**Export**, and export the blacklist and whitelist to the storage device.

Step 2 You can edit the exported file on your computer.

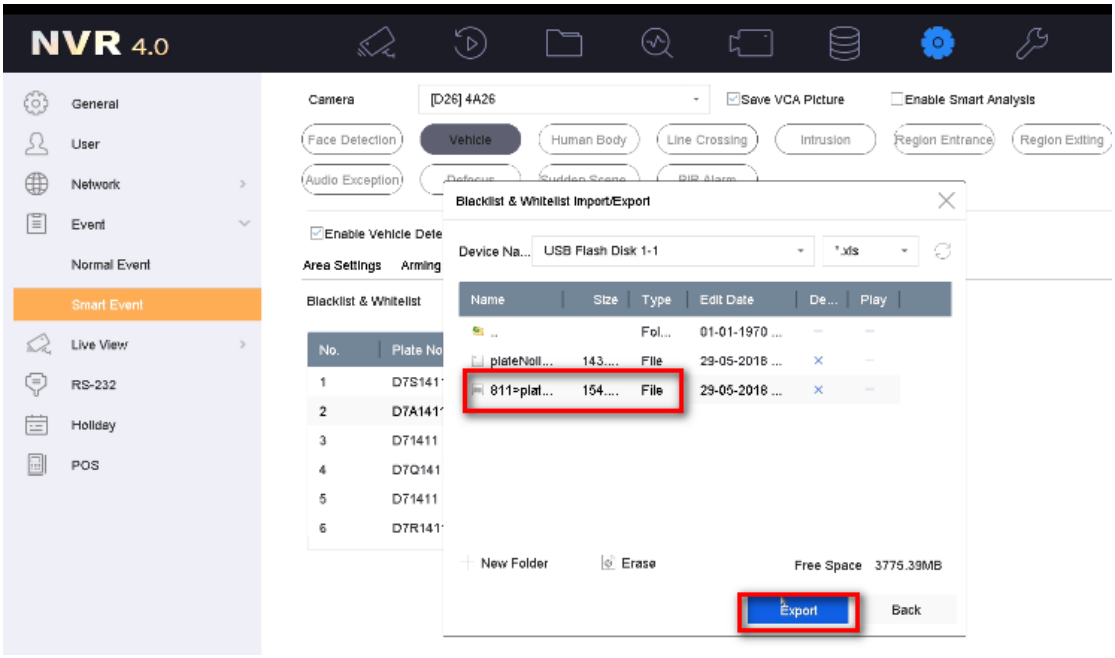


Figure 3-18 Export Blacklist and Whitelist

Configure Event Recording Schedule for ANPR Camera

To get the vehicle detection triggered video clips more accurately, you need to configure the record schedule on local NVRs. Please see the detailed configuration below.

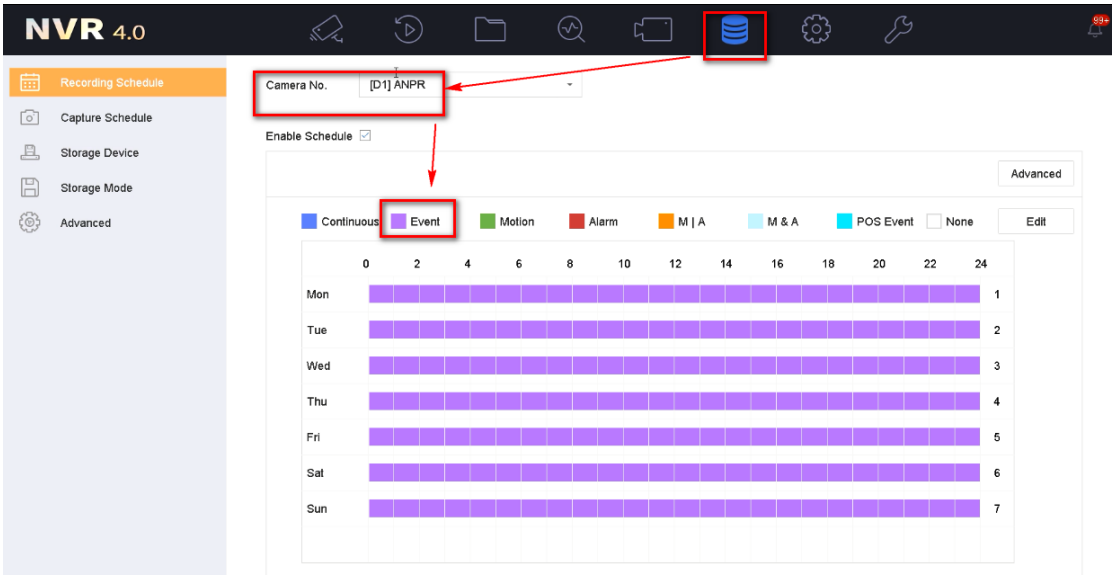


Figure 3-19 Configure Event Recording Schedule

Search Vehicle Detection Results

Step 1 Go to **Playback**->**Custom Search.**

Step 2 Select the event type to **Vehicle**.

Step 3 Set the search conditions, including the sart time/end time, plate No. area/country, ect.

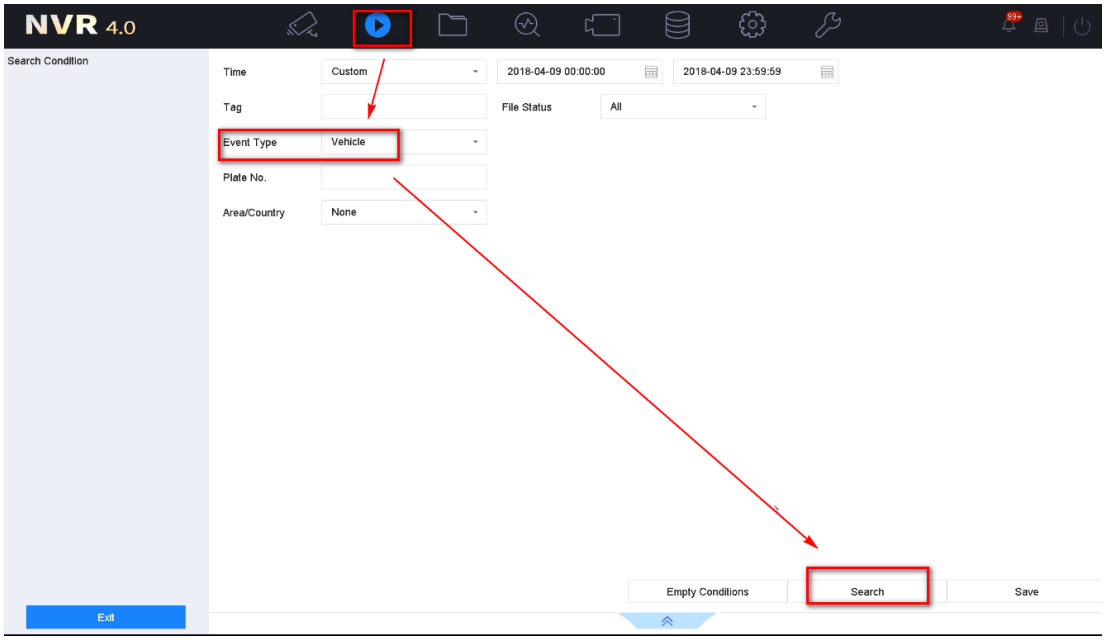


Figure 3-20 Search Vehicle Detection Results

Step 4 Click **Search** to get the matching vehicle detection results.

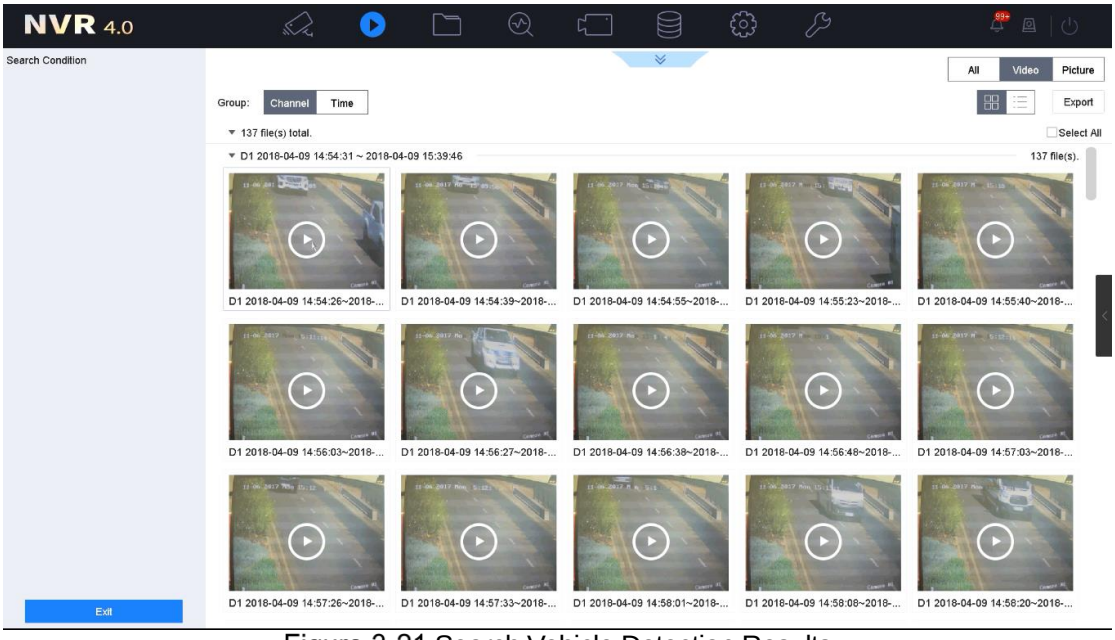


Figure 3-21 Search Vehicle Detection Results

3.3.3 Product Selection

We recommend the following products for use in the solution.

Table 3-2 Product List

Product	Product Model	Description	Image
NVR	K2/K4/K8 Series	Up to 8/16/32-ch IP cameras input Third-party network cameras supported,8 MP resolution recording	

	I Series	Up to 8/16/32/64-ch IP cameras input, Third-party network cameras supported, 12 MP resolution recording	
	Super I Series	Up to 64/128/256-ch IP cameras input, Third-party network cameras supported, 12 MP resolution recording	

3.4 NVR+IPC+iVMS

3.4.1 Description

The iVMS-5200 Pro is a centralized management monitor system which is developed by HIKVISION based on SOA architecture. iVMS-5200 Pro provides the central management, information sharing, convenient connection and multi-business integration.

In this solution mode, the iVMS-5200 Pro is used for devices and video management and NVR for storage. As NVR does not support algorithm identification locally, it should be used with the ANPR camera which is connected to a LAN deployment.

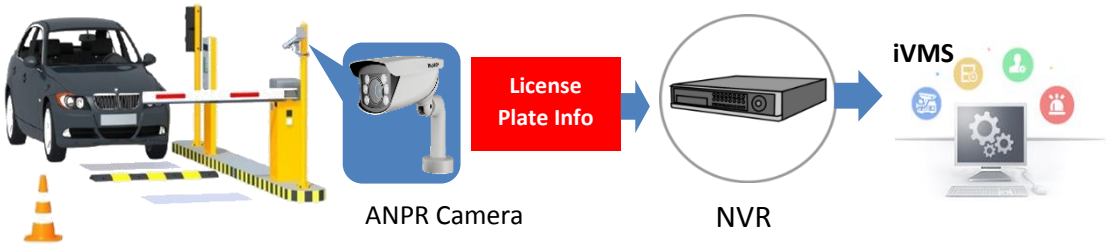


Figure 3-22 NVR+IPC+iVMS Solution Mode

3.4.2 Configuration

Configure LPR on iVMS-5200

Step 1 Open the Web Manager page of iVMS-5200 Professional, log in and go to **Resource Management**.

NOTE

The default user name is *admin* and the password is*12345*.

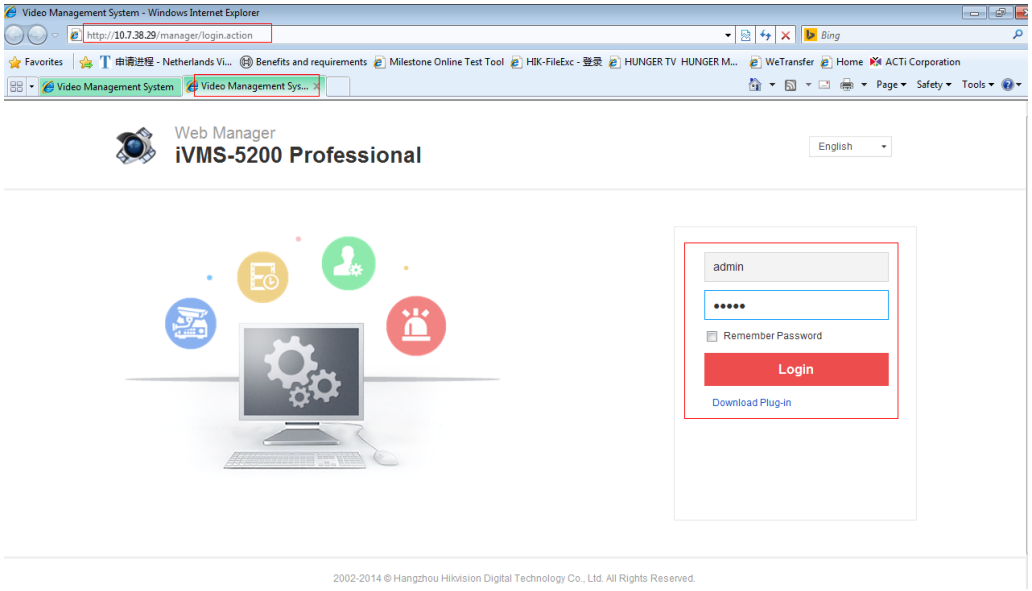


Figure 3-23 Login to iVMS-5200

Step 2 Select **Encoding device** and add the NVR into the software.

Step 3 Click **OK**. You will see the device online.

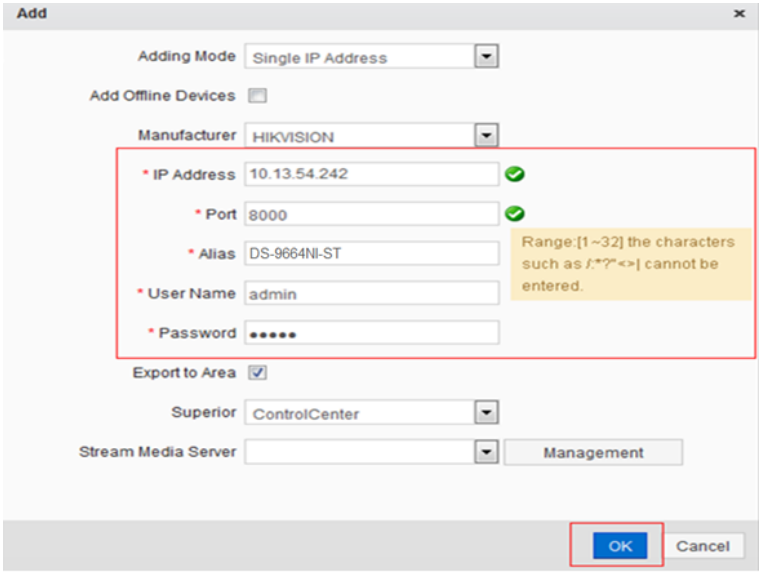


Figure 3-24 Add NVR to iVMS

Step 4 Go to **Remote Configuration**->**Vehicle Detection**.

- Configure vehicle detection.
  1) Check **Enable Vehicle Detection**, and select the **Total Number of Lanes** and **State**.

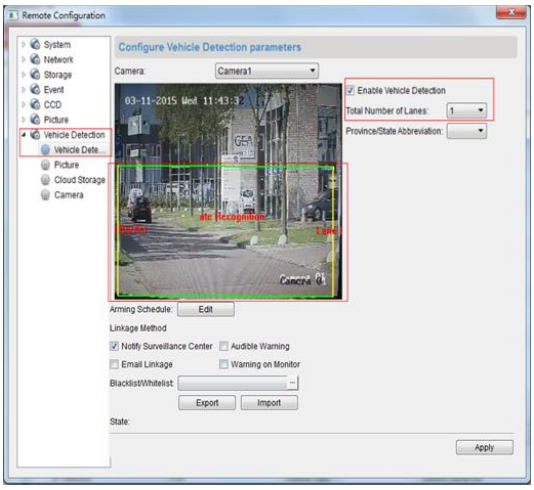


Figure 3-25 Enable Vehicle Detection

2) Click ***Draw*** to draw the vehicle detection area.
3) Click **Edit** to configure the arming schedule of vehicle detection and the alarm linkage methods.

NOTE

The **Notify Survillance Center** must be selected to send alarm to the client.

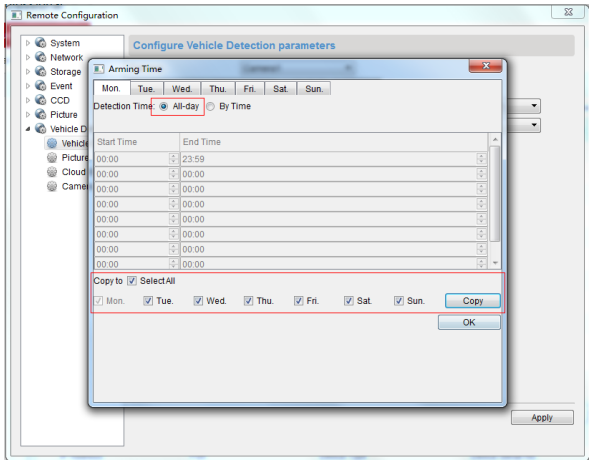


Figure 3-26 Set Arming Schedule

- Configure the picture parameters of license plate.

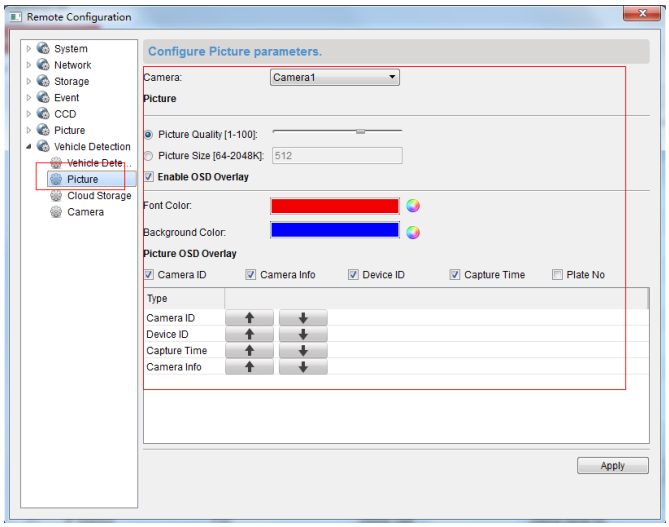


Figure 3-27 Set Picture Parameters

- If you want to upload the pictures to the cloud, configure the cloud storage settings.

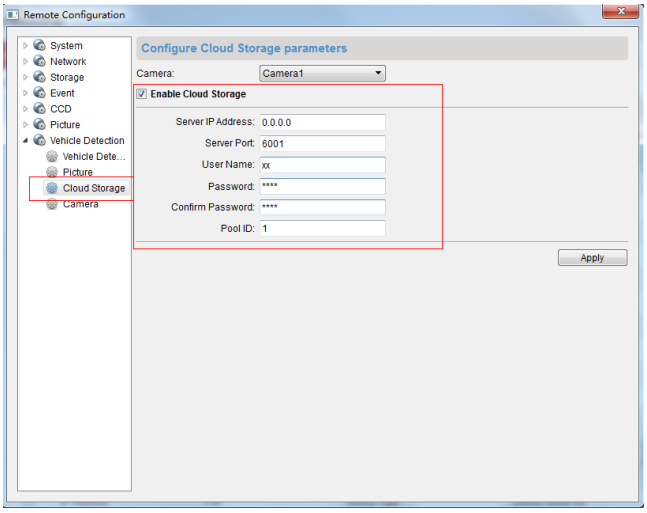


Figure 3-28 Set Cloud Storage

Configure Device Storage

Click **Resource Management** to configure the record storage. Select the **Storage Location** to **Encoding Device**.

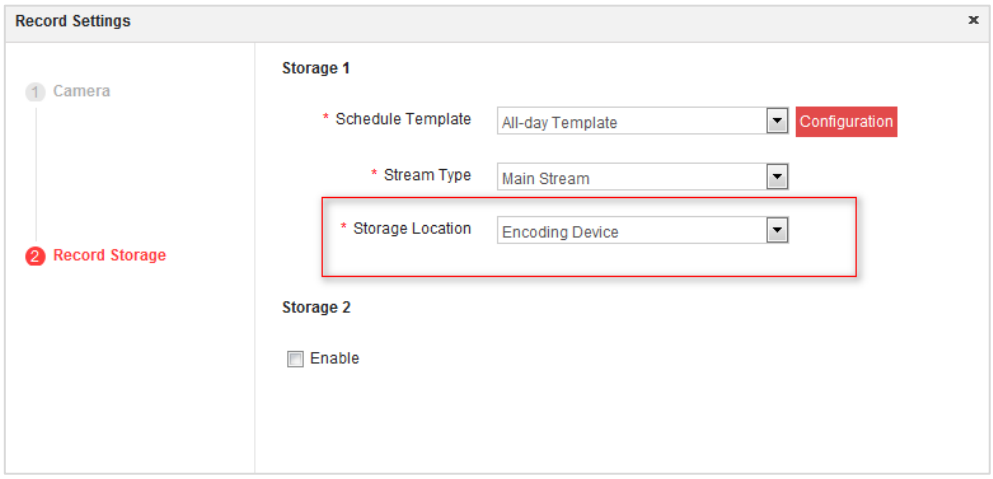


Figure 3-29 Set Record Storage

View LPR Live Video and Results

Step 1 Open iVMS-5200 Control Client and connect to the correct CMS. Access the **License Plate Recognition** module in the control panel.

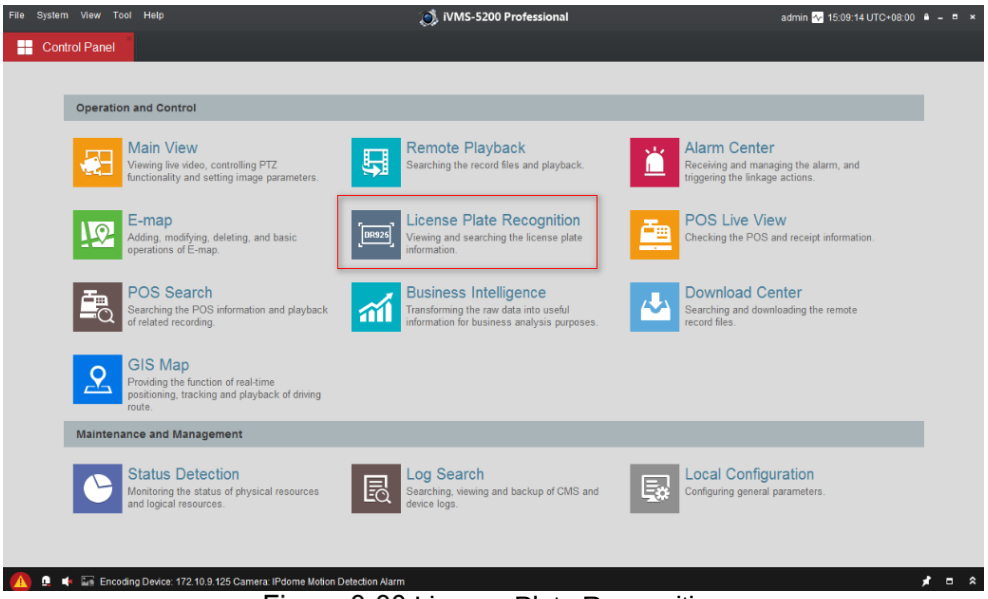


Figure 3-30 License Plate Recognition

Step 2 Click the **Live View** tab.

Step 3 Select the camera to live view. And the captured plate pictures will be displayed synchronously.

Figure 3-31 Live View

Step 4 Double-click the plate, and the detailed info is available.

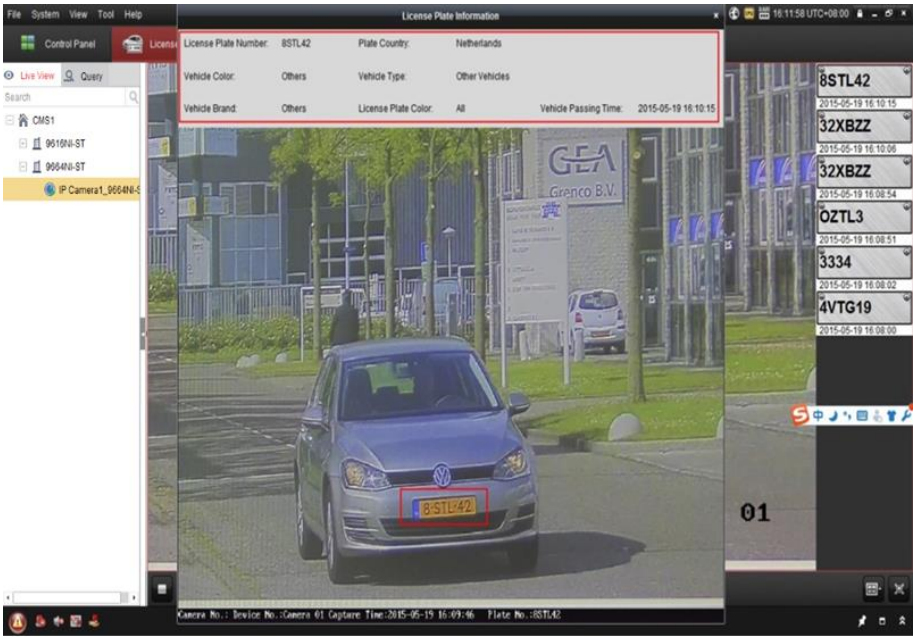


Figure 3-32 View LPR Results

Search LRP Results

Step 1 Go to **License Plate Recognition**->**Query**.

Step 2 Select the camera from the device list.

Step 3 Set the search conditions, including the country, search type and the start time/end time.

Search by License Plate Number: search all the images related to the specified license plate.

Search by Other Conditions: search by conditions like the vehicle logo, vehicle color, plate color, etc.

Step 4 Click **Search**. The matched plate info will be displayed.

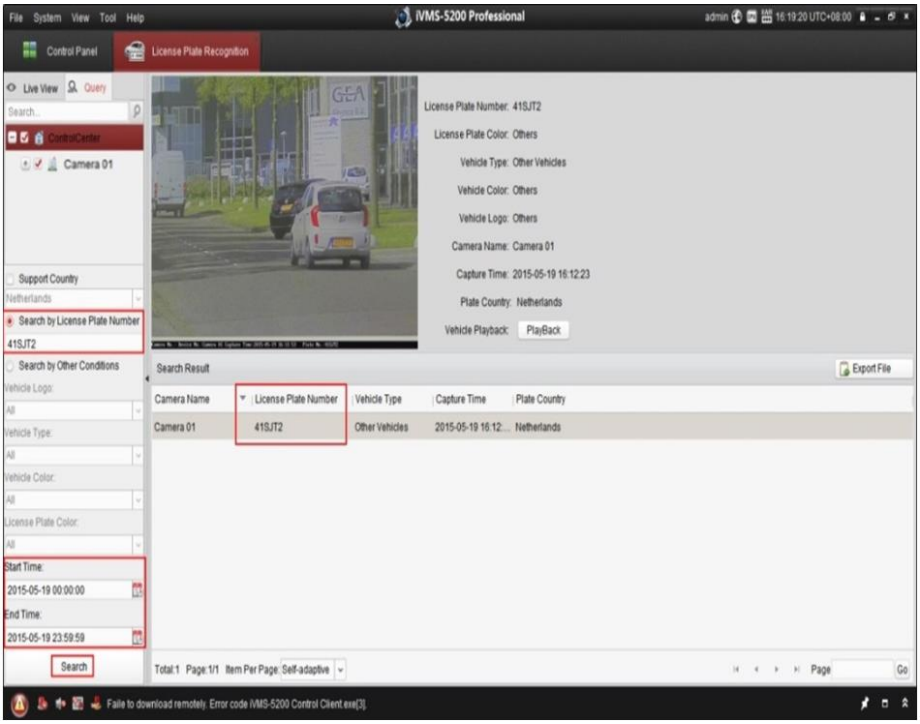


Figure 3-33 Search Plate Results

Step 5 Select an item from the results list and click **Playback** to play the video.

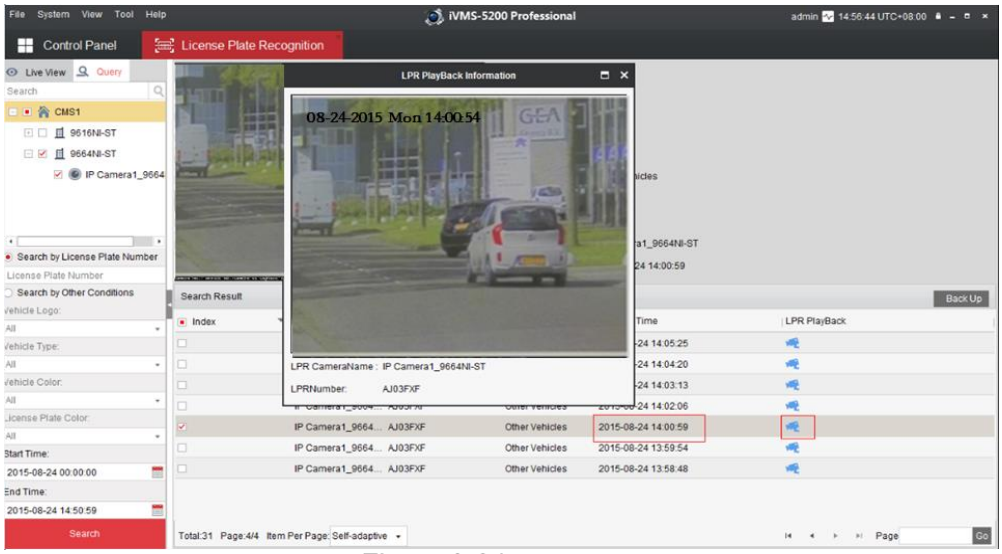


Figure 3-34 Play Video

Export LPR Results

Step 1 Go to **License Plate Recognition**->**Query**.

Step 2 Search the license plate images.

Step 3 Select the items from the results list and click **Back Up**.

Step 4 Select the content. The plate image or video will be saved to your local directory.

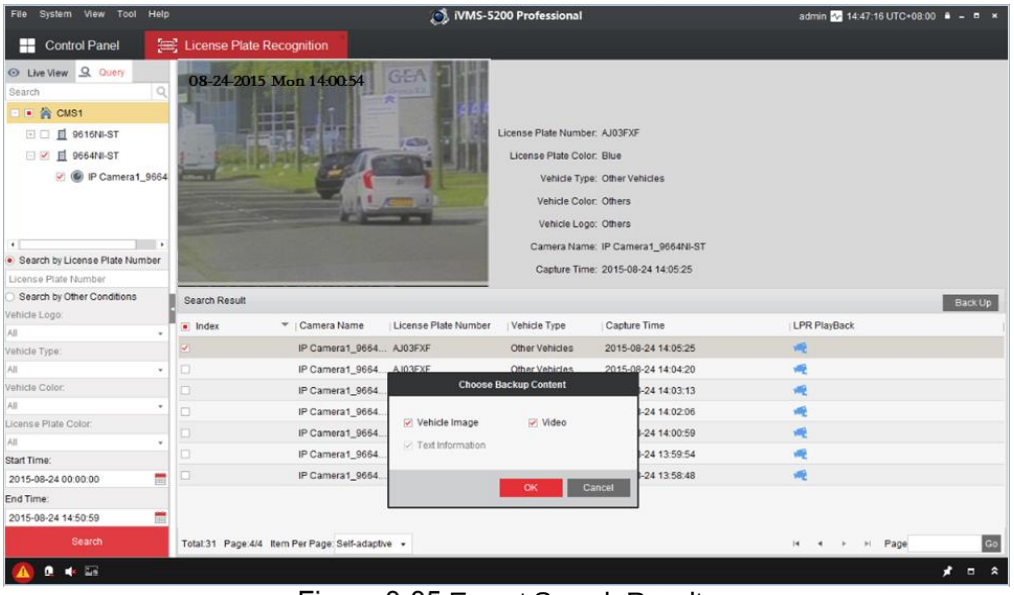


Figure 3-35 Export Search Results

3.4.3 Product Selection

We recommend the following products for use in the solution.

NOTE

Please refer to section 3.2.5 and section 3.3.3 for the recommended IPC and NVR products.

Table 3-3 Product List

Product	Product Model	Description
Platform	iVMS-5200 Pro, with LPR module	1024 channel maximum

Chapter 4 Integration

4.1 Integration Summary

- Blacklist and whitelist
- Upload ANPR alarm event
- Get alarm info
- Control barrier

4.2 Integration Method

- **SDK**: The device network SDK is developed based on private network communication protocol, and it is designed for the remote connection and configuration of embedded DVR, Encoder, IPC and the other IP devices.
- **ISAPI**: ISAPI is a kind of Hikvision protocol, based on HTTP. It is available to all kinds of platforms, such as console application, web application and so on.

4.3 Detailed Functions

4.3.1 Blacklist and Whitelist

Description:

After capturing the vehicle picture, you can control the entry of vehicles according to the license plate recognition results. The vehicles in blacklist are not allowed to enter, while the vehicles in the whitelist are allowed to enter. And the alarm will be uploaded in arming or listening mode.

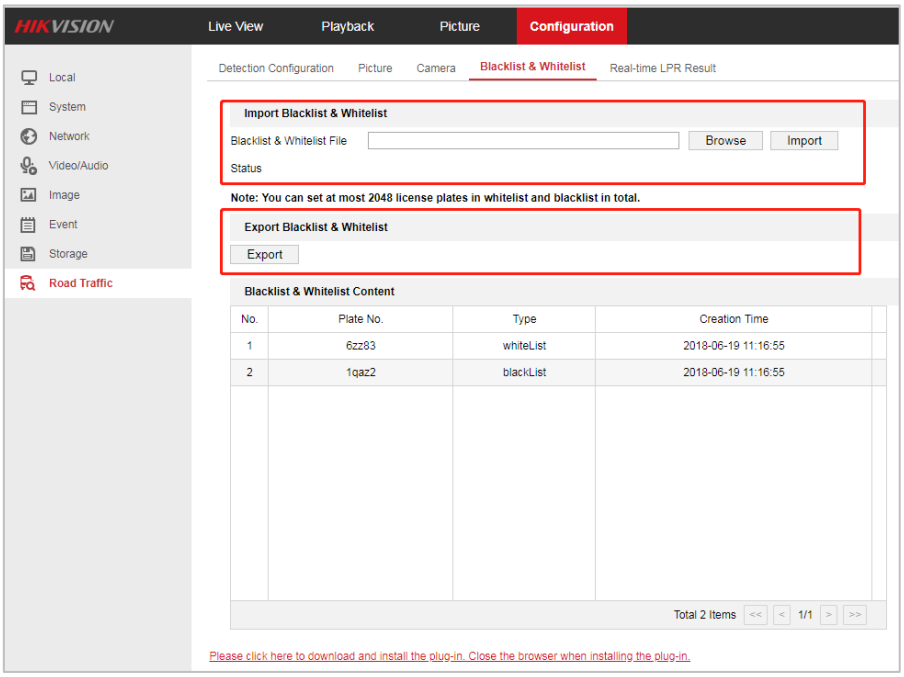


Figure 4-1 Blacklist & Whitelist

Integration Method:

- Export the Template
  ISAPI URL: GET /ISAPI/Traffic/channels/<ID>/licensePlateAuditData
  SDK command: NET_DVR_Start_Download
- Import Blacklist and Whitelist
  ISAPI URL: PUT /ISAPI/Traffic/channels/<ID>/licensePlateAuditData
  SDK command: NET_DVR_UploadFile_V40
- Receive Alarm Info.
  The related alarm type is COMM_ITS_PLATE_RESULT or COMM_UPLOAD_PLATE_RESULT, and the alarm information structure is NET_ITS_PLATE_RESULT or NET_DVR_PLATE_RESULT

Please refer to Chapter 4.3.2 Upload Alarm Info.

4.3.2 Upload Alarm Info

Description:

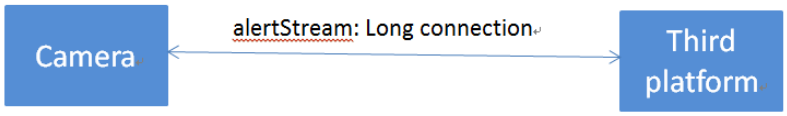
If the vehicle appears in the monitoring image during a certain time period, and the recognition parameters are configured, the ANPR camera will capture the vehicle picture automatically. Then the camera analyzes the license plate and uploads the ANPR alarm.

Arming Mode

Description:

SDK/ connects to device actively, and send alarm uploading command, while the device will send alarm to SDK immediately when the alarm is triggered.

Establish a long connection between camera and third-party platform.



Integration Method:

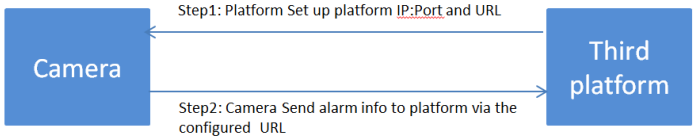
- ISAPI URL: GET /ISAPI/Event/notification/alertStream
  Note: If Heartbeat/Network timed out, platform should call this ULR to reconnect
- SDK COMMAND: Call NET_DVR_SetDVRMessageCallBack_V31 to set alarm callback function for receiving and handling alarm information.

Listening Mode

Description:

SDK will not connect to device actively, and only the configured port will listen and receive the alarm information uploaded by device.

Step 1 Set up platform IP: Port and URL



Integration Method:

- ISAPI URL: PUT /ISAPI/Event/notification/httpHost
- SDK COMMAND: NET_DVR_SetDVRConfig
- Main fields: IP Address, port and receive URL.

  E.g., 127.0.0.1:8088/receiveANPRUrl.
- pictureType: small, big, all

  Small means small picture, big means big picture, all= small + big

Step 2 Cameras send alarm info via the configured URL

ISAPI URL:

POST <ipAddress>:<portNo>/<url>

Key alarm info in the http body:

channel, dateTime, licensePlate, region, country, vehicleType, wehicleColor, eventType=vehicleDetection

Notification XML Alert

```
POST
/?channelID=1&dateTime=2014-12-30T11:03:40+08:00&eventType=vehicleDetection&licensePlat
e=1234567&region=EU&country=France&vehicleType=motorVehicle&vehicleColor=black
HTTP/1.1
Authorization: Basic YWRtaW46MTIzNDU=
Content-Type:image/jpeg
Content-Length:15453

(The binary data of JPEG is omitted.)
```

4.3.3 Get Alarm Info

Description:

Customer can use ISAPI to get real time to get ANPR alarm info directly.

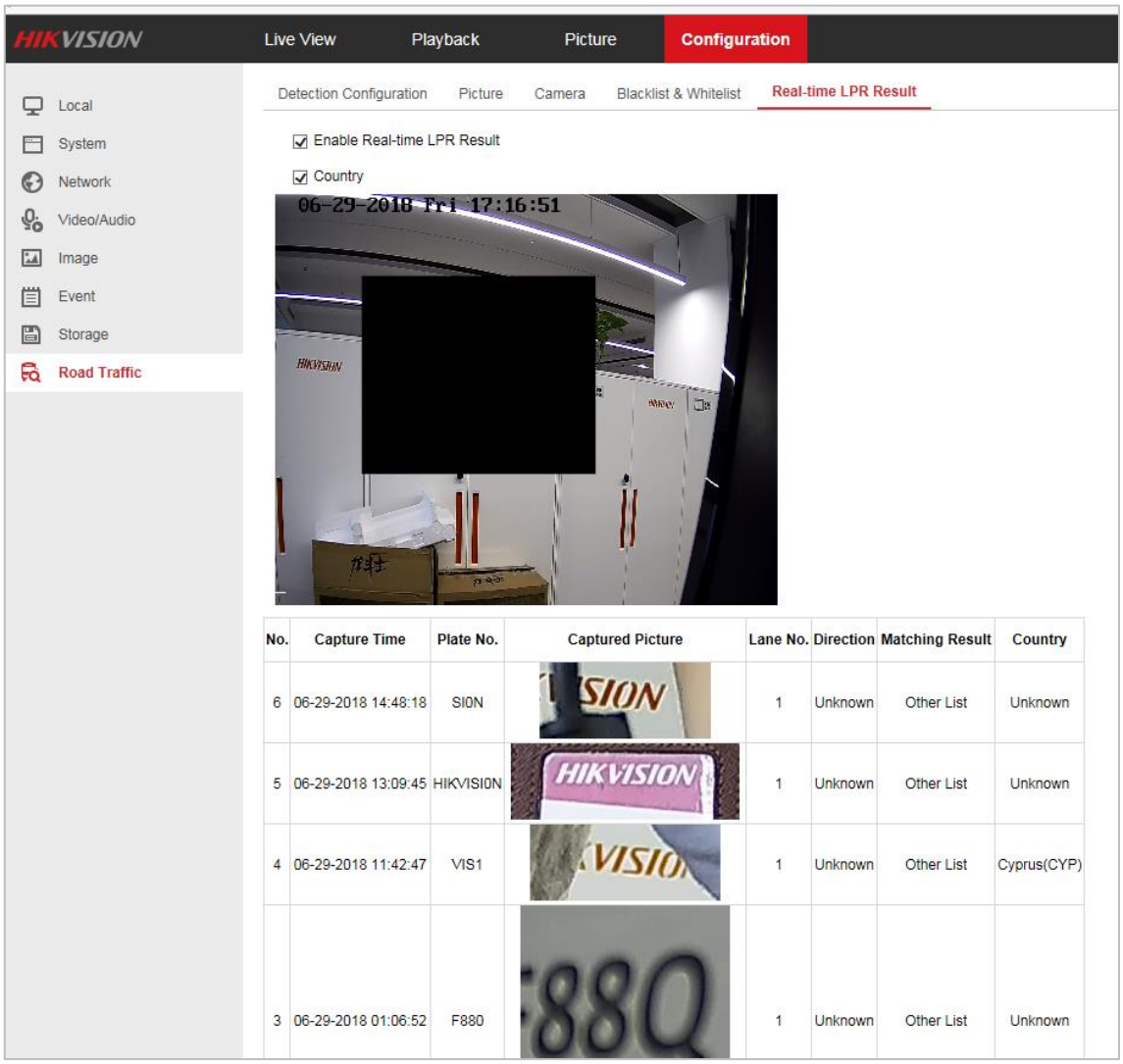


Figure 4-2 Get LPR Results

ISAPI URL: /ISAPI/Traffic/channels/<ID>/vehicleDetect/plates

You can get alarm info contains: captureTime, plateNumber, picName, country.

SDK Command: NONE.

4.3.4 Control Barrier

You can directly open or close the barrier gate via some entrance and exit devices to realize the remote control of barrier.

ISAPI URL: NONE

You can get alarm info contains: captureTime, plateNumber, picName, country.

SDK command：Call NET_DVR_RemoteControl


See Far, Go Further