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ZenLPR-SOFFA

User Guide

ZenLPR-SOFFA Version V_6.6.4

Table of Contents

1. Introduction

VEER is the technical arm of SOFFA, and SOFFA uses the ZENLPR for SOFFA users' digital access/exit. This part of our software is the part of its engine which is integrated with Milestone XProtect.

On top of the digital access to parking, SOFFA offers a parking service platform which is activated upon the entrance to a parking unveiling many functionalities/benefits to the parking ecosystem through its users' application and vendors' application.

That service platform provides touchless automated payments, additional services such as SOFFA promotions & advertising and SOFFA membership and access to SOFFA's management portal for data/statistics visualization.

Traffic control and vehicle owner identification has become a major problem in every country. Sometimes it becomes difficult to identify vehicle owner who violates traffic rules and drives too fast. Therefore, it is not possible to catch and punish those kinds of people because the traffic personal might not be able to retrieve vehicle number because of its speed. For that reason, there is a need to develop License Plate Recognition (LPR) system as a one of the solutions to this problem. There are numerous LPR systems available today.

In last few years, license plate recognition (LPR) has been one of the useful approaches for vehicle surveillance. It can be applied in public places for some purposes like traffic safety enforcement, automatic toll text collection, car park system, Data collection for multipurpose analytics and Automatic vehicle parking system.

ZenLPR is a turnkey LPR/ANPR solution:

1- Multi resource Streams and frames management
2- Vehicle image capture, identification, and crop
3- Number plate detection and character recognition
4- User-friendly interface for results manipulation
5- Smart Reporting system for management control

ZenLPR system plays an important role in many applications like electronic payment system. For example, in parking, number plates are used to calculate the parking duration. When a vehicle enters the gate, the license plate is automatically recognized and stored in the database. On leaving, the license plate is recognized again and compared with the stored numbers in the database. The time difference is used for calculating the parking fee. ZenLPR is convenient and cost efficient as it is automated.

Before the License Plate Recognition stage, several pre-processing techniques have to be performed to improve the quality of images. Pre-Processing stage is an aid to improve the LPR rate. These stages will be discussed below.

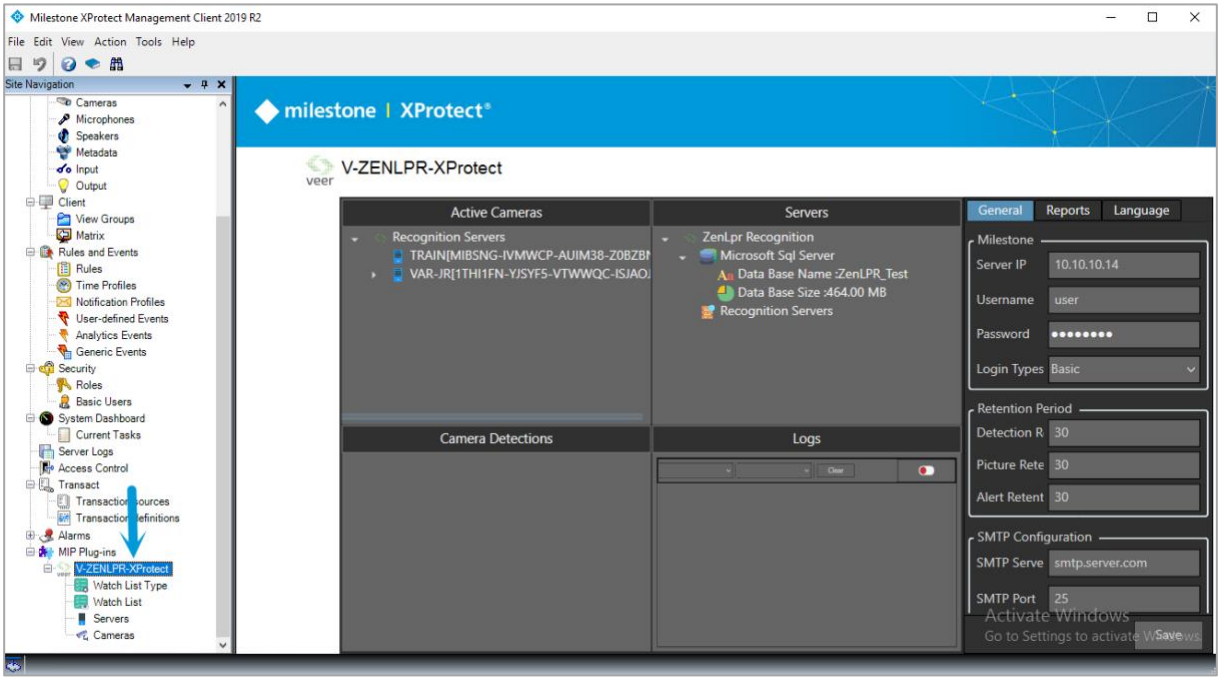
V-ZENLPR XProtect

2. ZenLPR Management Client Plugin

ZenLPR is fully integrated with All Milestone XProtect versions starting 2016 R2 and above. It also supports all cameras supported by Milestone VMS (more than 8000 camera types).

V-ZenLPR-XProtect appears in Site Navigation under MIP Plug-ins after its installation.

2.1. Dashboard



V-ZENLPR-XProtect dashboard opens in the right window. It shows the sections listed below. Each section will be explained in detail:

1- Active Cameras
2- Camera Detections
3- Servers Logs
4- General Configuration
5- Reports
6- Language

2.1.1. Active Cameras

Active Cameras window shows all cameras grouped by servers as well as their status (Active/Not Active).

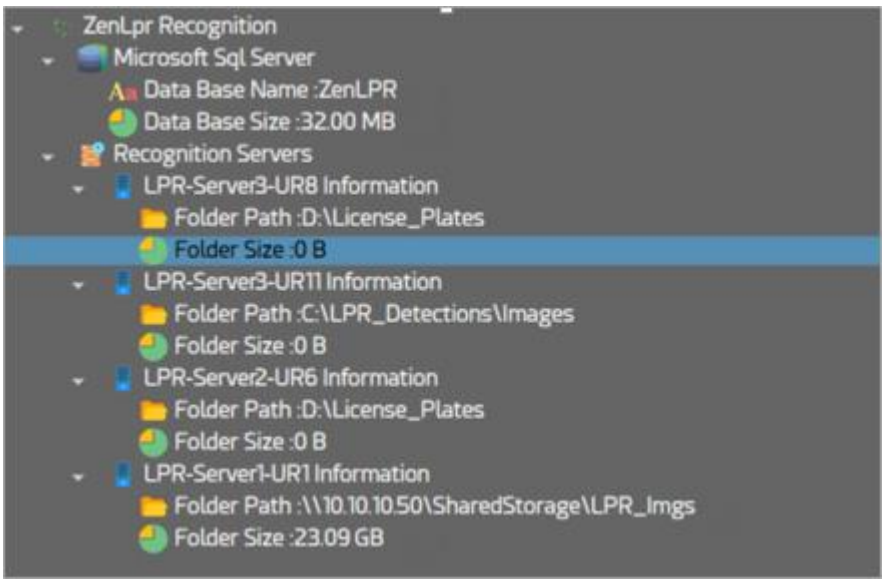
Example: the server LPR-Server3-UR8 has one active camera AXIS P1365 Network Camera.

2.1.2. Camera Detections

This window shows the number of detections for each camera.

Example: the camera AXIS P1365 Network Camera detected 17538 plates.

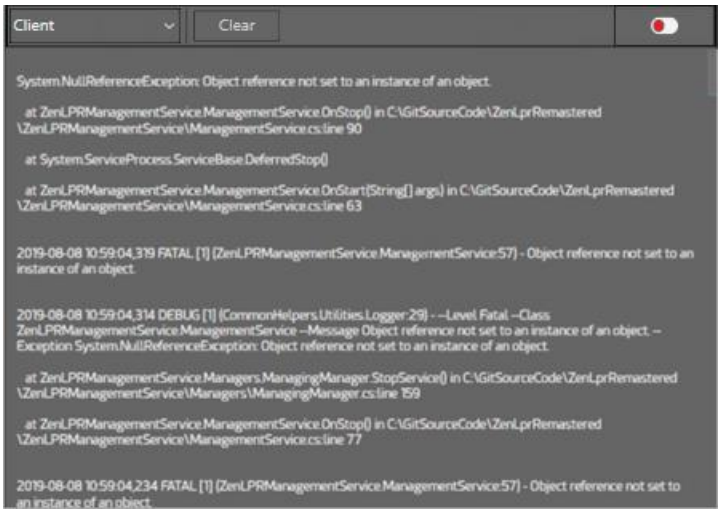
2.1.3. ZenLPR Servers



This window shows all servers where detected plates are saved as well as the database name and size.

1- Data Base Name: ZenLPR
2- Data Base Size: 32.00 MB
3- Detected images are saved in the server LPR-Server1-UR1 under the folder \\10.10.10.50\SharedStorage\LPR_Imgs
4- The size of the detected plates is 23.09 GB.

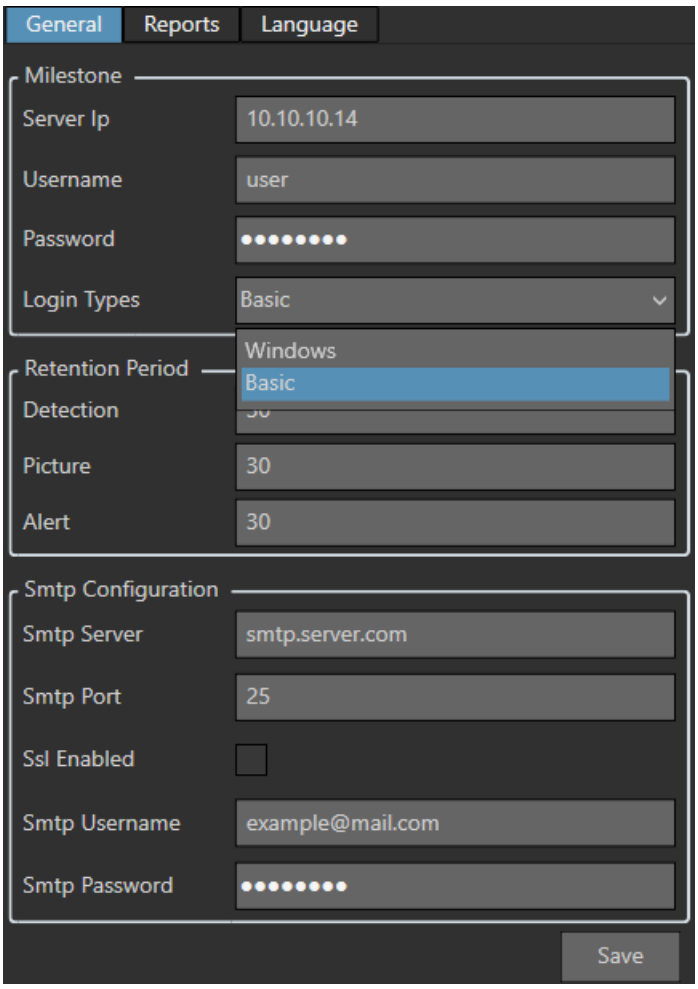
2.1.4. ZenLPR Logs



This window displays each plugin logs separately.
These logs can be disabled/enabled or cleared.

1- Select the logs you want to display
2- Clear logs. Logs will be cleared from this window but will remain in the system logs
3- Enable/Disable logs

2.1.5. General Configuration



The general configuration of ZenLPR is executed in the window above:
Milestone: this is a pure milestone connection configuration

1- Milestone XProtect Server IP
2- Milestone XProtect Username
3- Milestone XProtect Password
4- Milestone XProtect Login Types: Window or Basic

Retention period:

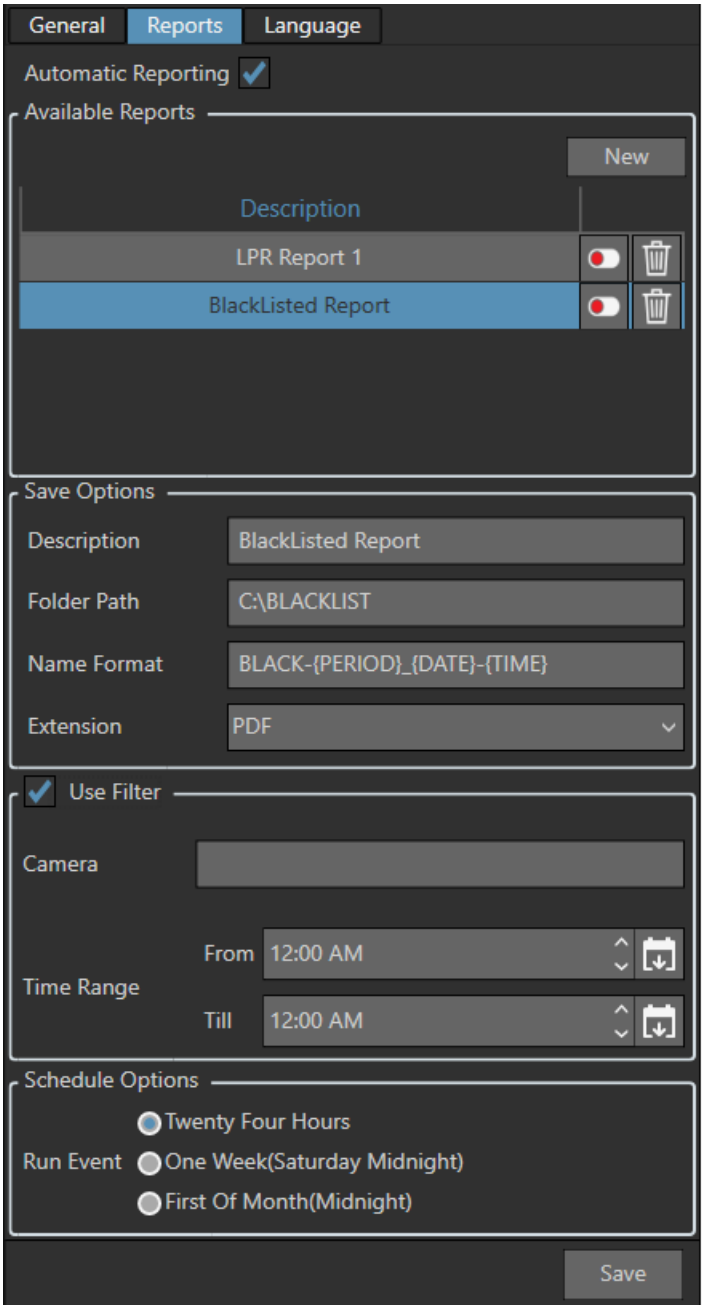
1- Detection: number of days the detections are retained in the database
2- Picture: number of days the detected pictures are retained in the database
3- Alert: number of days alerts are retained in the database

SMTP Configuration: SMTP server is used to send emails once an alert is triggered

1- SMTP Server IP
2- SMTP Server Port
3- SSL Enabled: Enable/Disable SSL in SMTP Server
4- SMTP Server Username
5- SMTP Server Password

Click on **Save** button to save the configuration.

2.1.6. Reports



Reports' configuration is executed in the window above.

Automatic Reporting: Enable/Disable automatic reporting
Available reports: all available reports will appear. Select a report to modify its properties.
Save Options:

1- Description: the report name
2- Folder Path: the location in which the generated reports will be saved (valid directory)
3- Name Format: the name format of the generated reports
"{PERIOD}" will be replaced by "DAILY", "WEEKLY", "MONTHLY" based on your selection.
"{DATE}" will be replaced by date of the report ex: "Mon 5-08-2019"

"{TIME}" will be converted to the time of the report ex: "05-49-14 AM".

4- Extension: select the report type (Excel or PDF)

Ex: "LPR-{PERIOD}_{DATE}-{TIME}" will generate the report: "LPR-DAILY_10:10:2019-11:06.pdf"

Use Filter: Enable/Disable filter

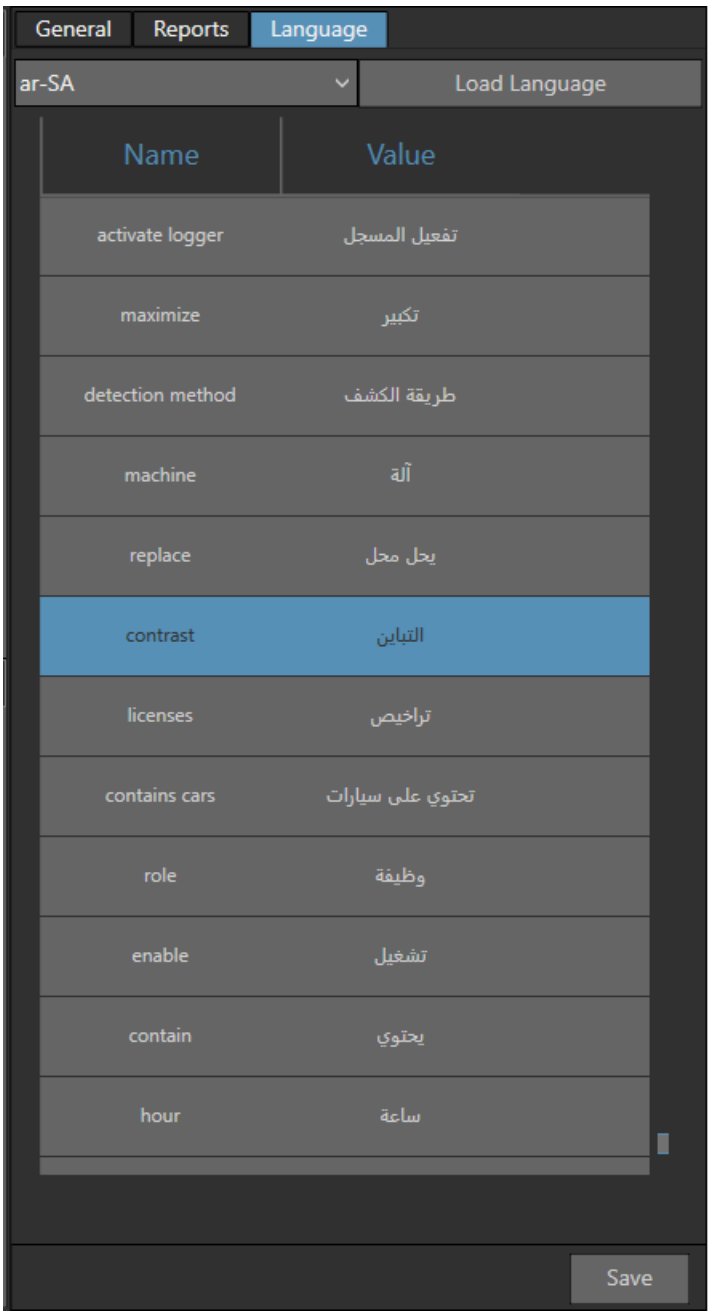
1- Camera: specify the camera name
2- Time Range: specify the filter time interval

Schedule Options:

1- Run Event: specify the report generation period (daily, weekly, monthly)

Click on **Save** button to save the report configuration.

2.1.7. Language

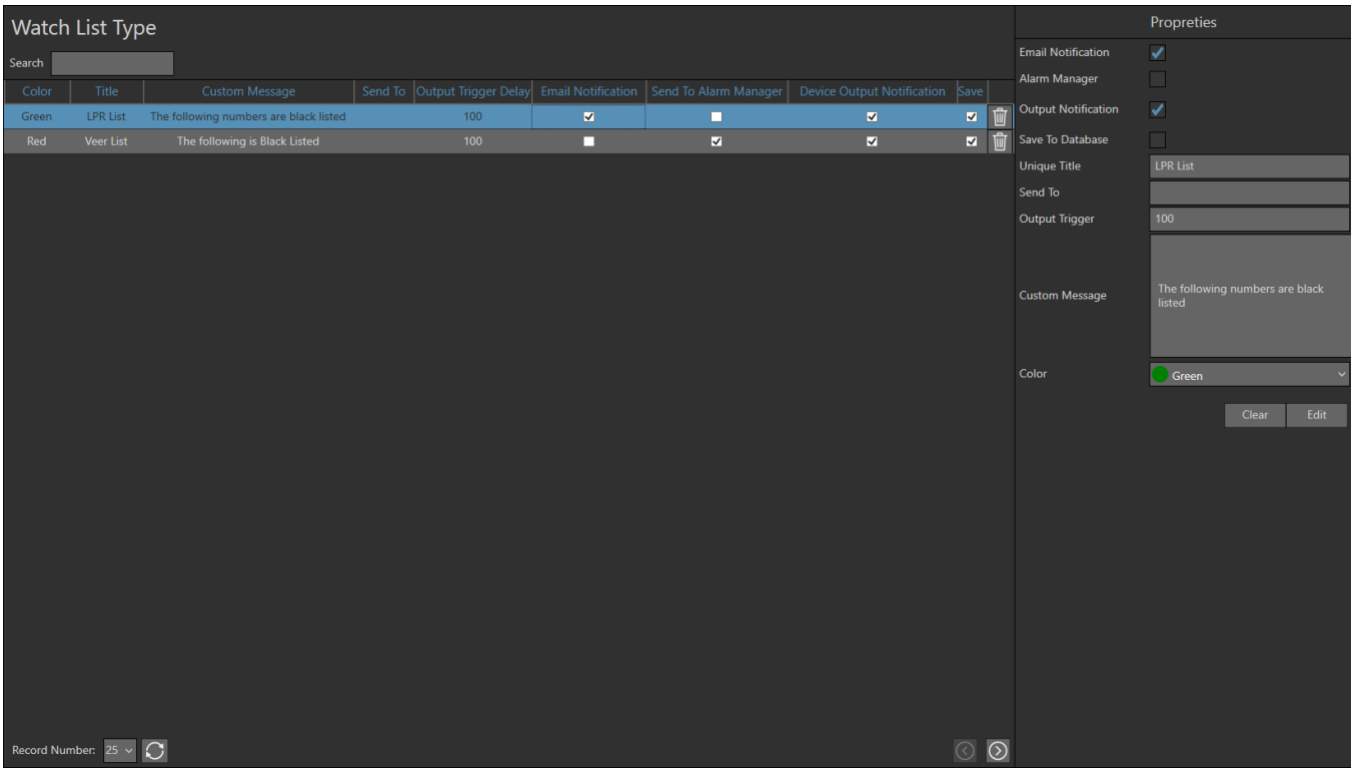


ZenLPR is available in several languages. From the list of languages, you can select the language you want to use.

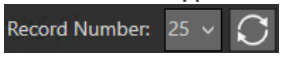
1- Select the language you want to modify
2- Click on **Load Language** to load the selected language
3- Double click on Value column to modify
4- Click on **Save** button to save your modifications

2.2. Watch List Type

A watch list type is created when the user wants to trigger a specific action after a plate has been detected.

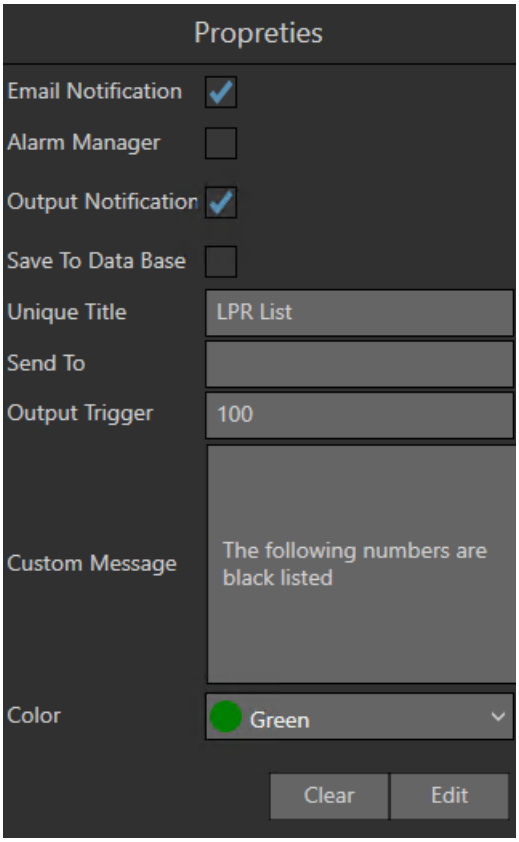


The window above shows all created watch list types in the left frame.
The user can search for an already created type using the search field on top of the window.

He can also delete an existing type using the delete button 
In the bottom of the window, Record Number shows the number of types displayed per page as well as the refresh button to refresh watch list types 

The arrows on the right corner allow the user to move from one page to another 

Watch list types are created in the Properties window on the right.



The watch list types' properties are defined in the fields below:

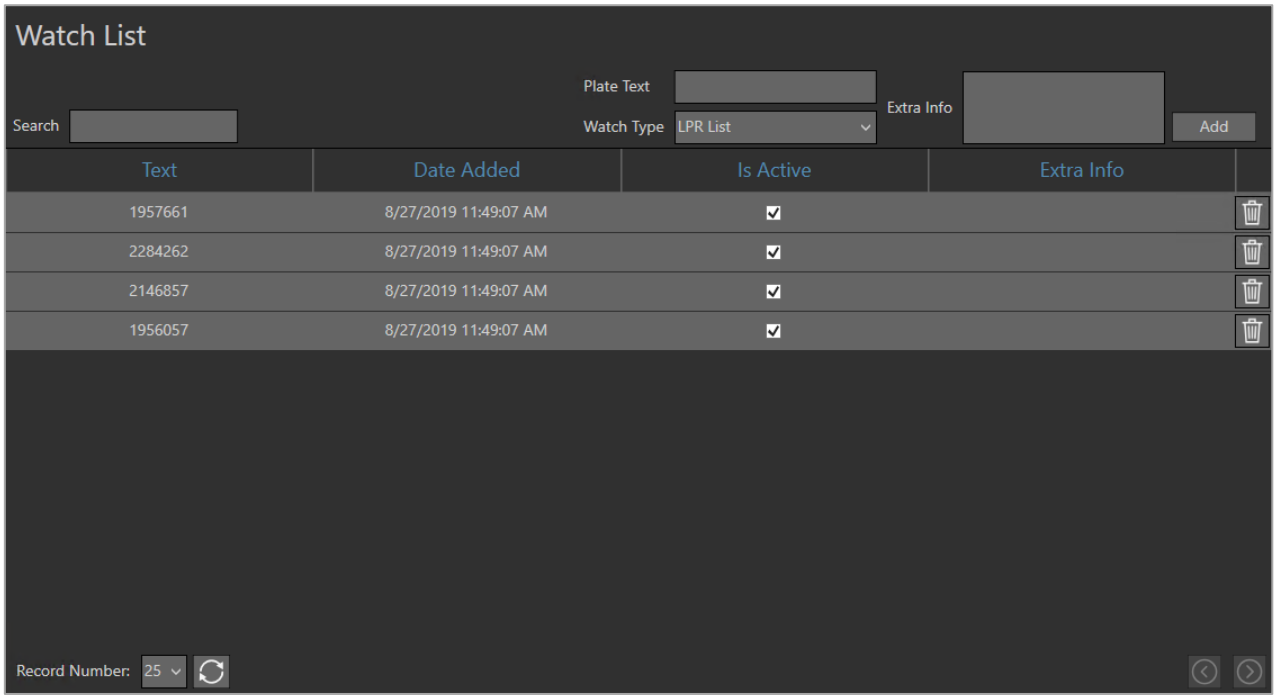
1- Email Notification: Enable/Disable email notification. If enabled, an email notification will be sent once an alert is triggered
2- Alarm Manager: Enable/Disable alarm. If enabled, triggered alerts are sent to Milestone alarm manager
3- Output Notification: Enable/Disable output notification. If enabled, a notification is sent once an alert is triggered
4- Save To Data Base: save the detected plate to the database
5- Unique Tittle: specify the title of the watch list type
6- Send To: specify an email address to send the notification
7- Output Trigger: specify the time delay between two output triggers
8- Custom Message: specify the message of the email to be sent
9- Color: specify the indicator color of the email sent

To clear properties data, use Clear button.

To modify a selected watch list type, use Edit button.

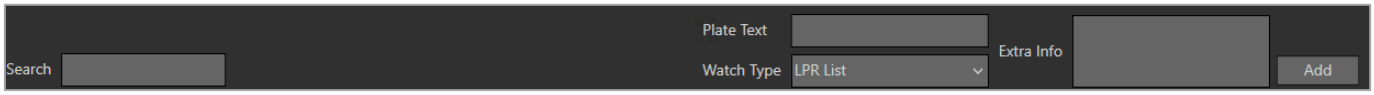
2.3. Watch List

A watch list is a list of individuals, groups, or items that require close surveillance, depending on the situation available, it may of business interest or of a security one.



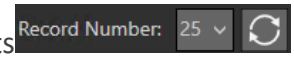
The widow above shows all watch lists created based on watch list types (explained in the previous section).

A watch list is created in the upper section as shown below:



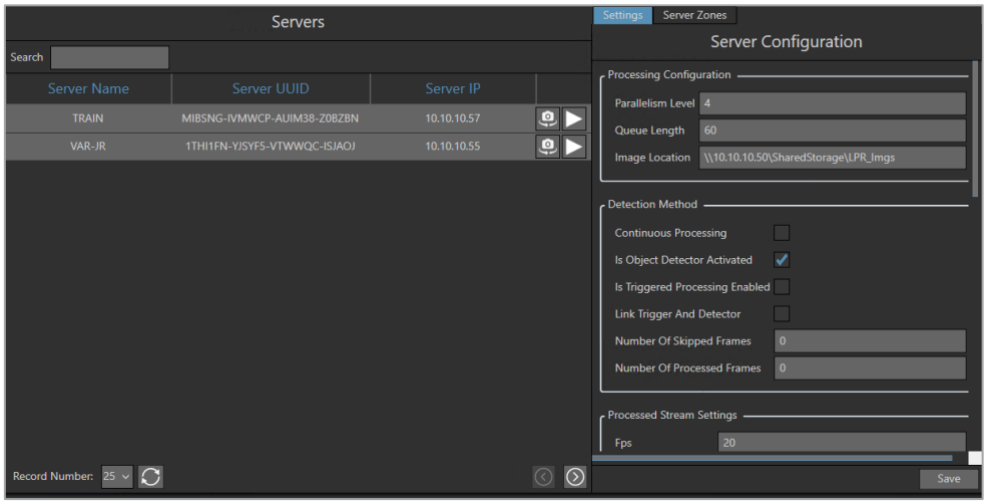
1- Search: search for an existing watch list
2- Plate Text: specify the plate text you want to watch. Once the system detects this plate, it will automatically trigger the action specified in the watch list type
3- Watch Type: select a watch list type already created
4- Extra Info: brief description about the watch list

To save the created watch list, use Add button.

To delete a watch list, use the delete button 
In the bottom of the window, Record Number shows the number of lists displayed per page as well as the refresh button to refresh watch lists 

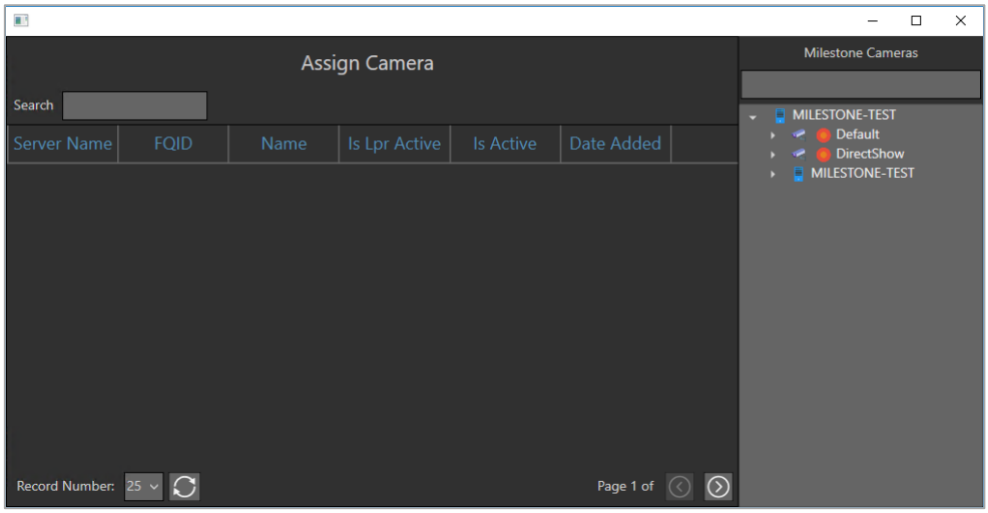
The arrows on the right corner allow the user to move from one page to another 

2.4. ZenLPR Server management

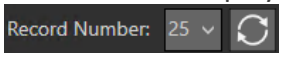


The window above shows all available servers in the left frame.
The user can search for an existing server using the search field on top of the window.

Clicking on the button  will open the following window, to assign a camera to the selected server.



Use the button  to start/stop the selected server.

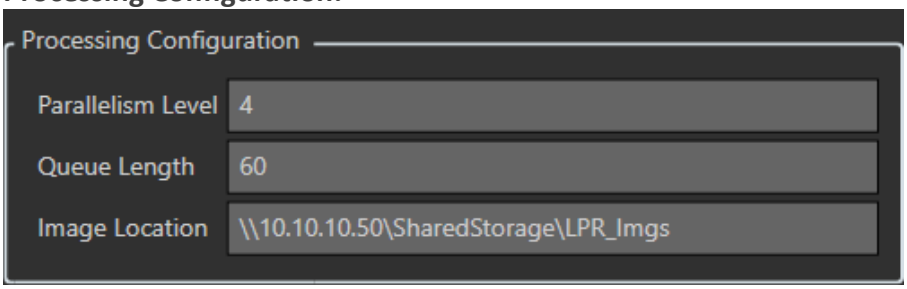
In the bottom of the window, Record Number shows the number of servers displayed per page as well as the refresh button to refresh available servers 

The arrows on the right corner allow the user to move from one page to another 

Servers are configured in Server Configuration window on the right.

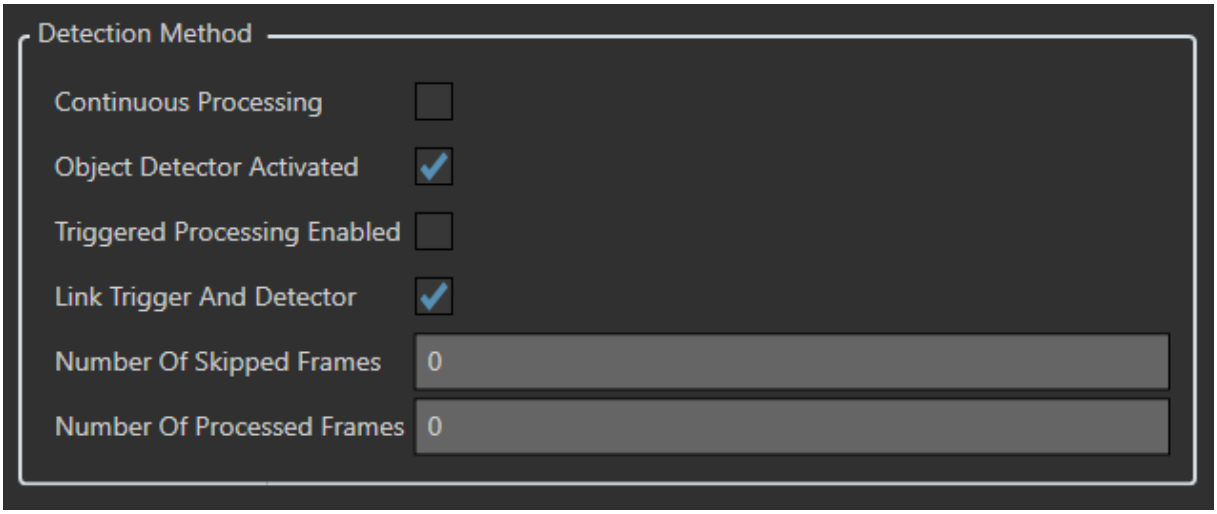
2.5. Server Configuration

Processing Configuration:



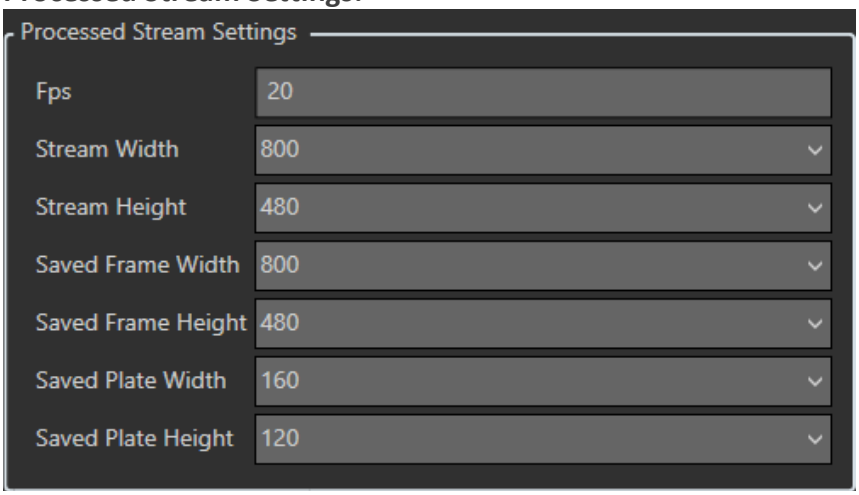
1- Parallelism Level: number of threads that will start the LPR recognition server (this number is based on the server CPU cores and power)
2- Queue Length: size of the queue that will process the image
3- Image Location: where the image of the detected plate is stored (valid path)

Detection Method:



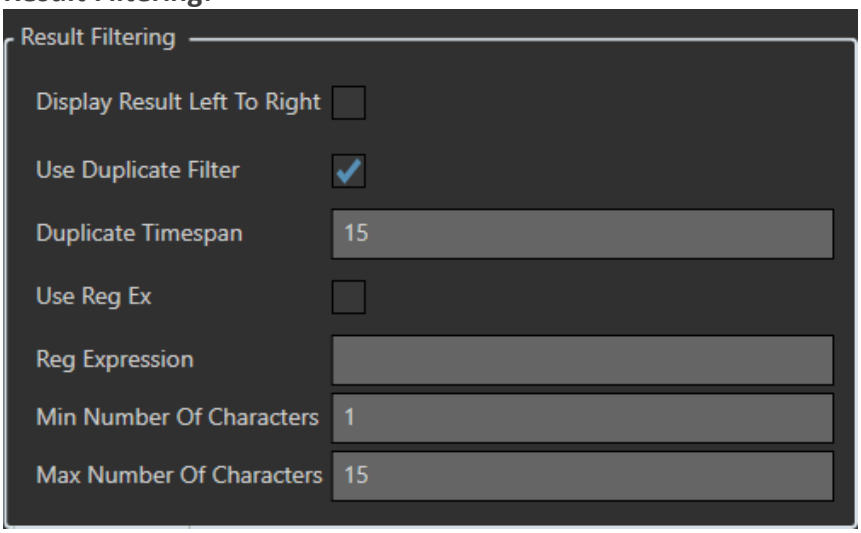
1- Continuous Processing: enable it for a nonstop LPR processing (more resource consuming)
2- Object Detector Activated: activate object detector which will enable the system to only process frames which contain a vehicle
3- Triggered Processing Enabled: enable/disable frame from milestone input, which will enable the system to only process frames (Number of Processed Frames) when the input device is activated for that specific camera in Milestone
4- Link Trigger and Detector: linking both pre filters allows the system to only process frames with Vehicles after being triggered by milestone, with this technique, you are optimizing the system to its best, since the system will only process a frame whenever a trigger is activated, then the object detector will make sure that there is a vehicle which is satisfies certain criteria to be processed
5- Number of Skipped Frames: number of frames to be skipped while processing images after a trigger event has been raised, this is highly effective in case when a small delay is needed before processing a frame on trigger
6- Number of Processed Frames: number of frames to be processed when triggered

Processed Stream Settings:



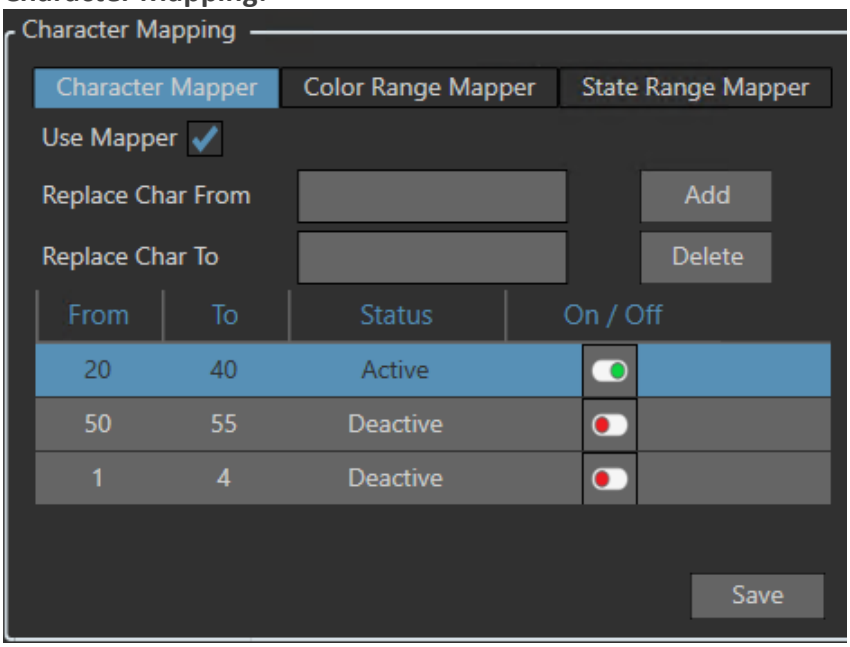
1- Fps: the stream frames per second
2- Stream Width: streaming camera width
3- Stream Height: streaming camera height
4- Saved Frame Width: the captured full frame image width
5- Saved Frame Height: the captured full frame image height
6- Saved Plate Width: the captured plate image width
7- Saved Plate Height: the captured plate image height

Result Filtering:



1- Display Result Left To Right: exported text orientation (left is En right is Ar)
2- Use Duplicate Filter: enable/disable filtering redundant detections within a timespan defined in the following field
3- Duplicate Timespan: the timespan of the duplicate filter
4- Use Reg Ex: select to detect plates with a specified pattern defined in the following field
5- Reg Expression: select the pattern of the detected plates
   Ex: 'A[0-9]{6}' indicates all the plates starting with an 'A' with 6 consecutive digits: A123456.
6- Min Number Of Characters: the minimum number of characters in a plate
7- Max Number Of Characters: the maximum number of characters in a plate

Character Mapping:



Character Mapper:

1- Use Mapper: Enable/Disable mapping. Mapping is associating one character to another, so that once a plate is detected, one character is replaced by the other. These two characters are specified in the fields below.
2- Replace Char From: the character to be replaced
3- Replace Char To: the replacing character
4- Add: add the created mapper. It will appear in the grid below
5- Delete: delete a selected mapper from the grid
6- On/Off: Enable/Disable mapping

Click on save to save the configuration.

Server Zones:

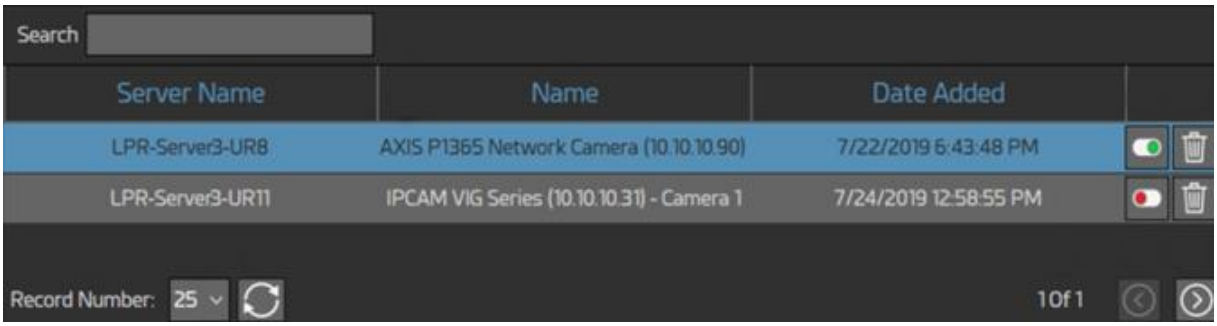
The window above displays camera zones for the selected server.

The camera zone configuration allows the user to set a speed limit rule for the cars detected by the camera. Server zones are servers grouped by camera zones.

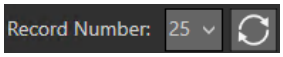
1- Search: search for existing camera zones
2- Add zone: add new zone to the server. Added zones will appear in the grid below. Click on a row to modify its properties
3- Clear button will clear modified values to restore modified ones
4- Save button will save changes to the database

2.6. Camera

In the left part of the window, all available cameras will appear.



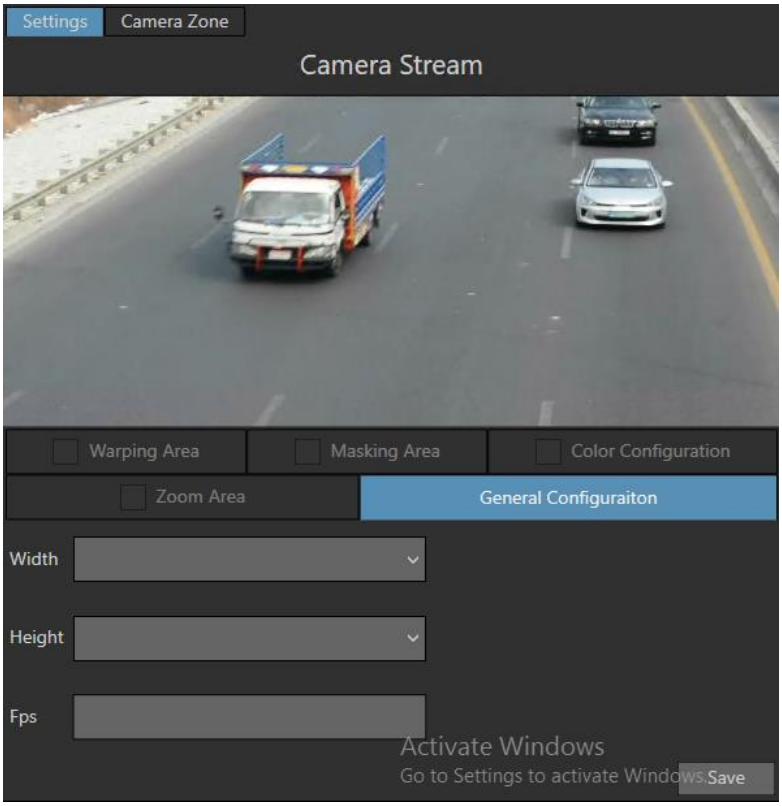
The user can search for an already created camera using the search field on top of the window.
He can also activate/deactivate a camera using the button .

To delete an existing camera use the delete button
In the bottom of the window, Record Number shows the number of cameras displayed per page as well as the refresh button to refresh cameras list 

The number of the current page as well as the number of pages appears as follows 

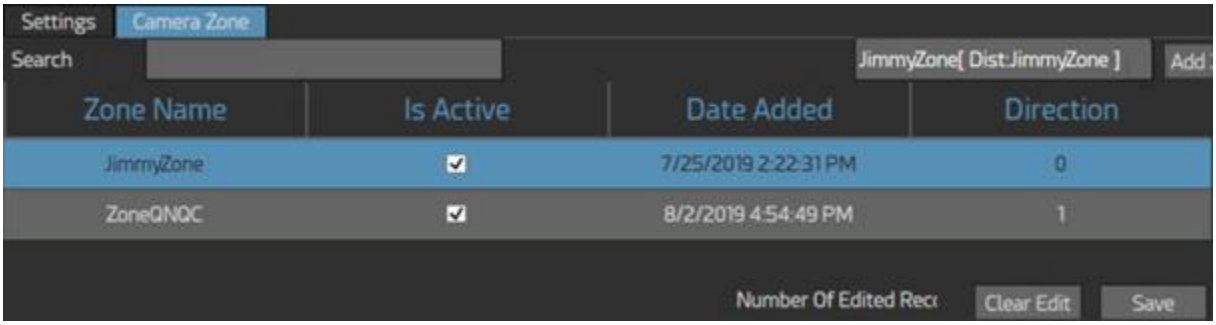
The arrows on the right corner allow the user to move from one page to another 
Camera settings and zones appear in the following window.

General Configuration:



The window above is used to adjust the stream size: height, width and Fps (frame per second)
Save all the configuration to the database using **Save** button.
Note: checkboxes will enable/disable their respective sections.

Camera Zone:



The window above displays existing camera zones.

A camera zone configuration allows the user to set a speed limit rule for the cars detected by the camera.

To add a new camera zone:

1- Search for an existing camera zones in search field
2- Select a server zone corresponding to the selected camera zone
3- Click on Add button to add the new camera zone.

Existing camera zones appear in the grid. Double click on a zone to modify its properties (Is Active, Date Added, and Direction)

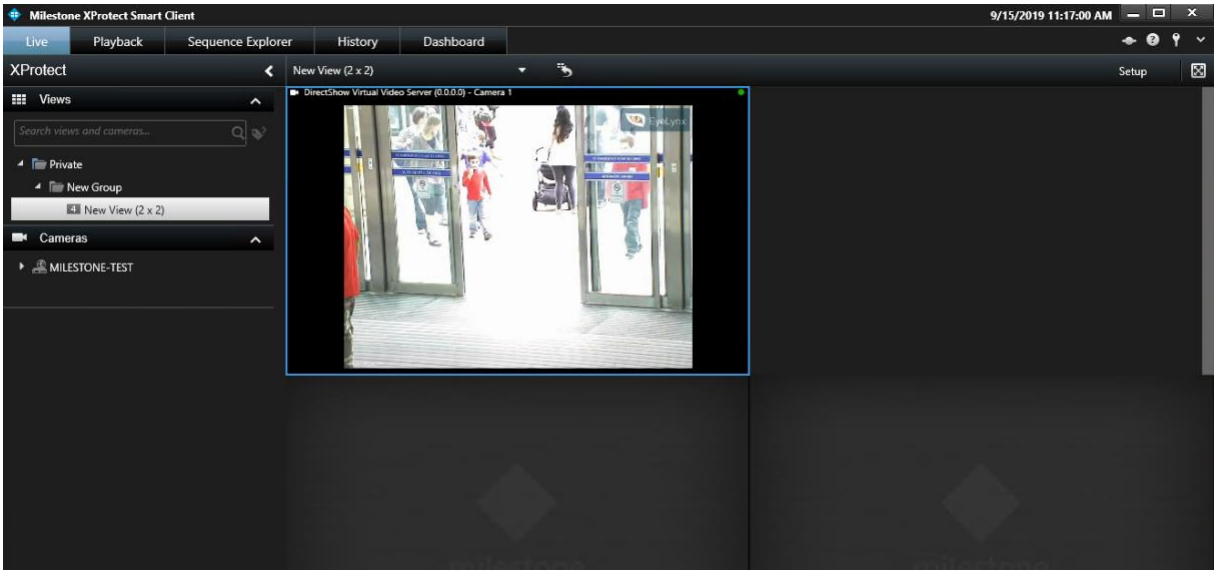
Number of edited recently indicates the number of zones edited but not saved yet.

Clear Edit button is used to clear modified values and restore saved ones.

Use **Save** button to save changes to database.

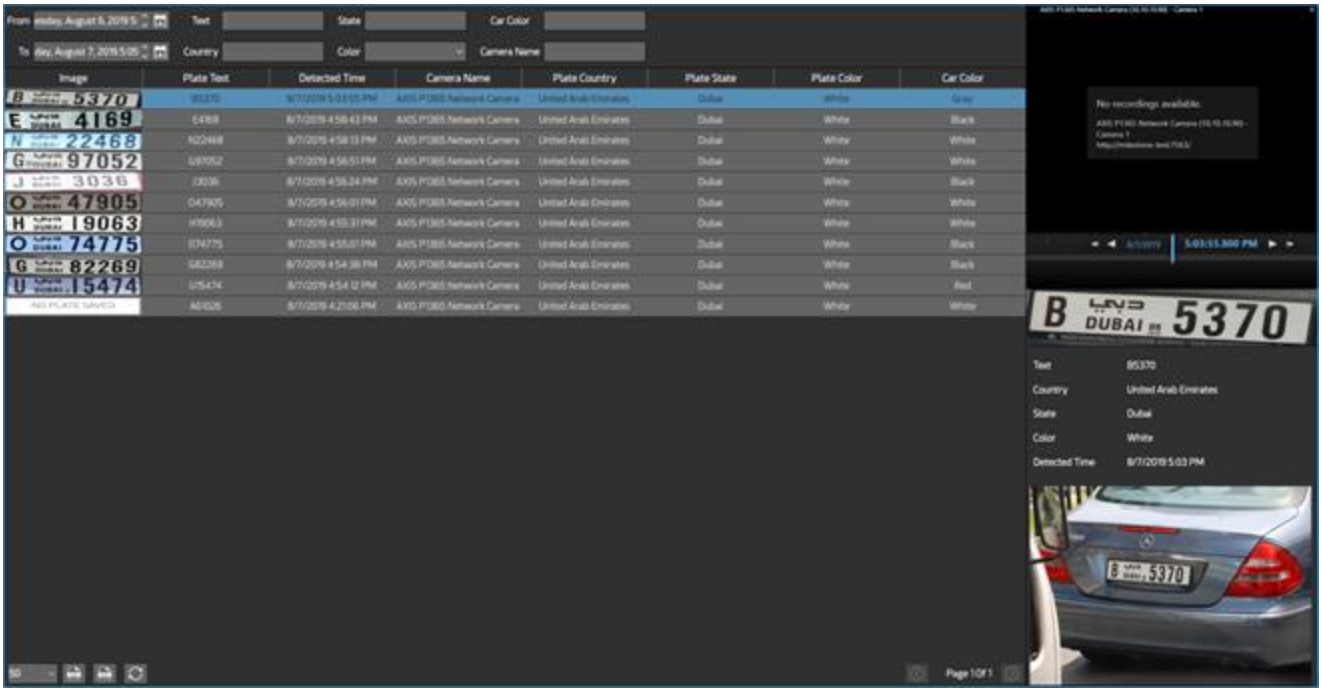
3. ZenLPR Smart Client Plugin

3.1. Home Page

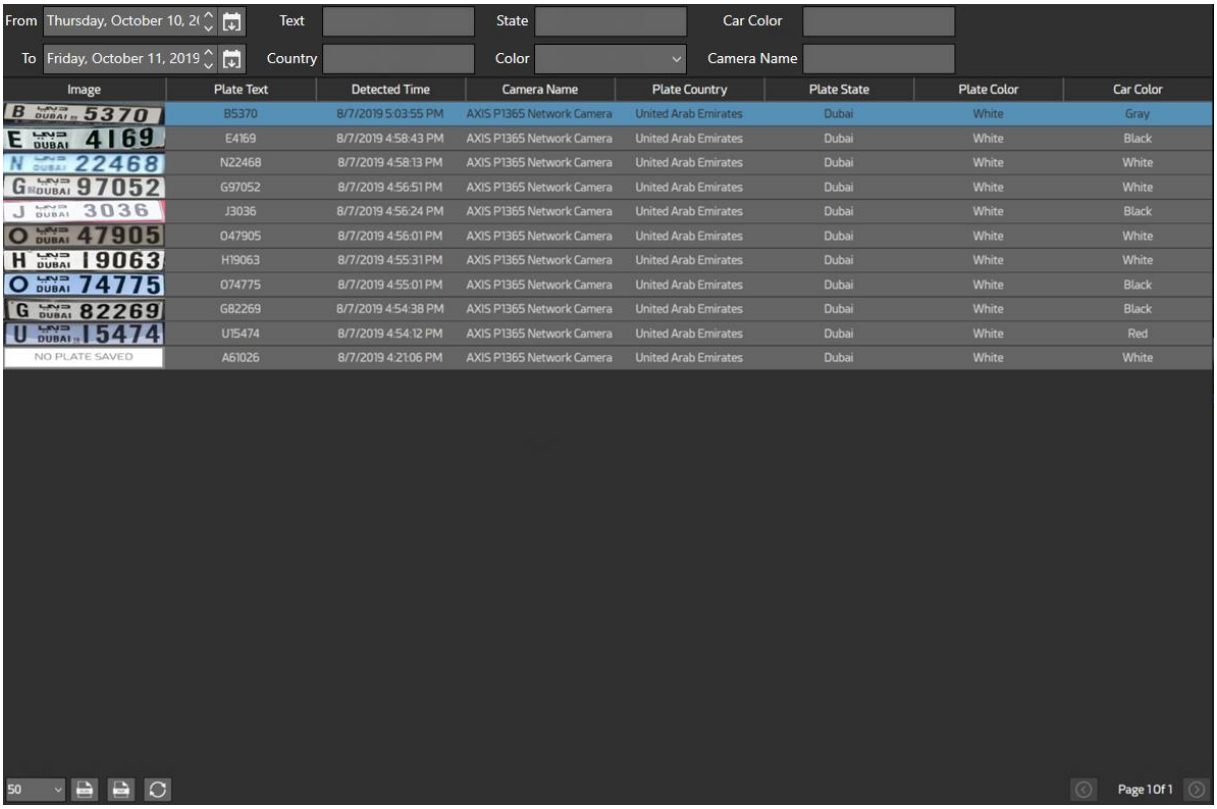


3.2. History

History is accessed through its own Tab in the Navigation Bar on top of the Milestone Stmart Client. This view displays the detected plates with their respective information (country, car color, state...). The user can view each plate in Milestone's recording playback and search for a specific plate.



Detected plates:



Detected plates can be filtered by:

1- From: displays all detected plates from the selected date
2- To: displays all detected plates to the selected date
3- Text: displays all detected plates based on the selected plate text
4- Country: displays all detected plates based on the selected country
5- State: displays all detected plates based on the selected state
6- Color: displays all plates with the specific color
7- Car Color: displays all plates with the specific car color
8- Camera Name: displays all plates that are detected by the selected camera.

In the bottom of the window, the following buttons appear:

The number of displayed plates in one page.

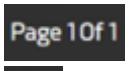

Export the selected data to excel.


Export the selected data to pdf.

Note: in case no row is selected, all data will be exported.


Refresh detected plates.

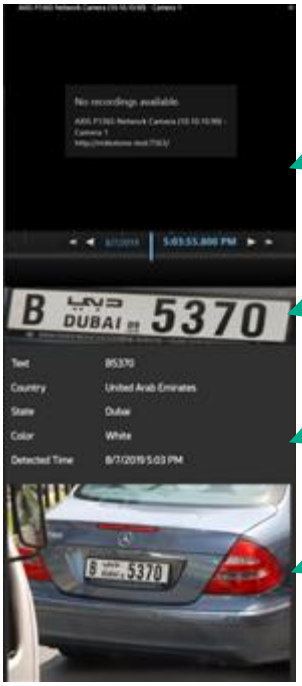

Go to the previous detected plates page.



Display the current page and all pages count.


Go to the next detected plates page.

Detected plate information:



Milestone's playback for the selected plated from the detected plates window

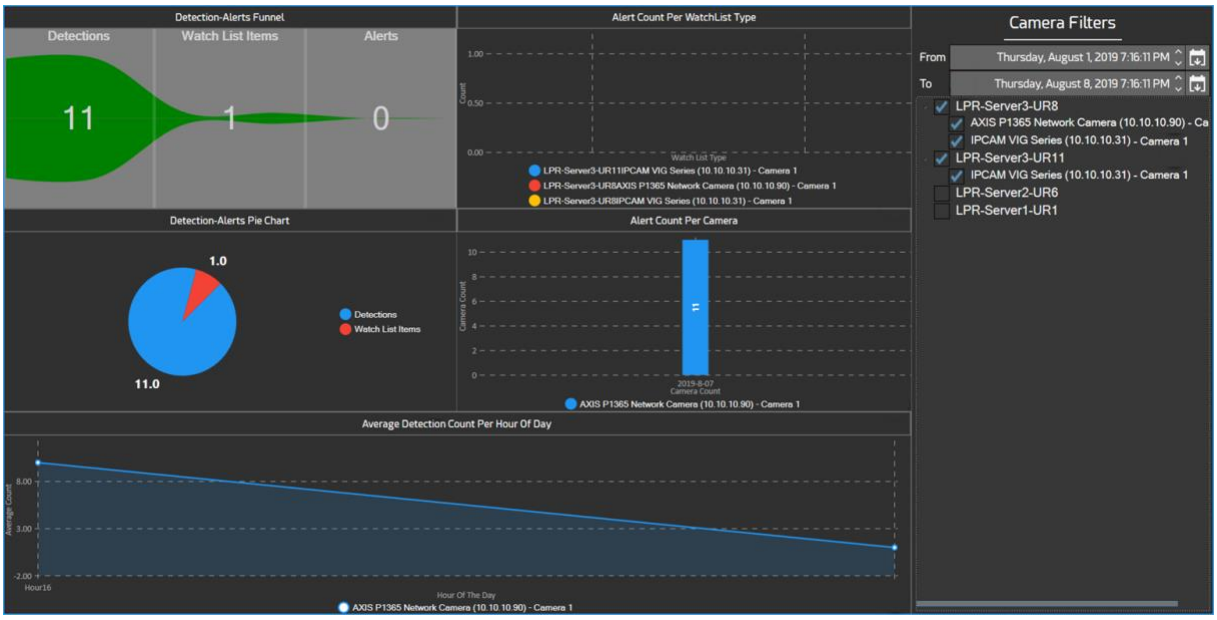
The segmented plate picture when detected

The detected plate information

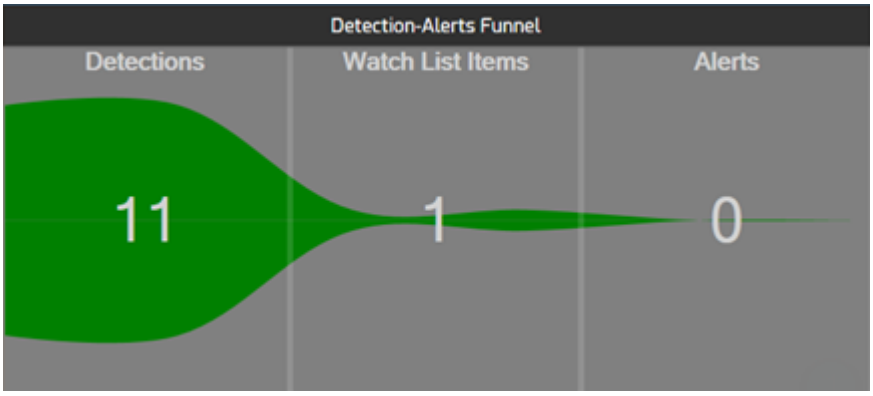
The full frame plate image on detection

3.3. Dashboard

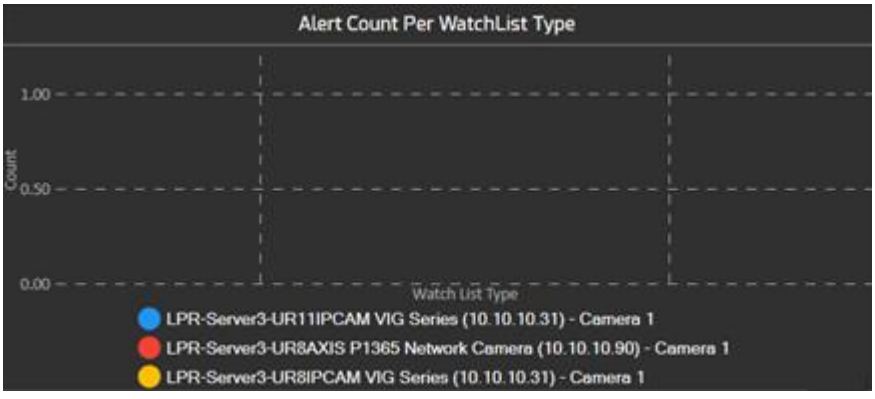
Dashboard is accessed through its own Tab in the Navigation Bar on top of the Milestone Stmart Client. This window displays the key performance indicators and have an analytical overview of the system's overall performance, usage and capacity. It also spotlights the critical information and organize your stored data to visualize it in one single window.



- This chart shows the user how many detections are watch listed and alerted.

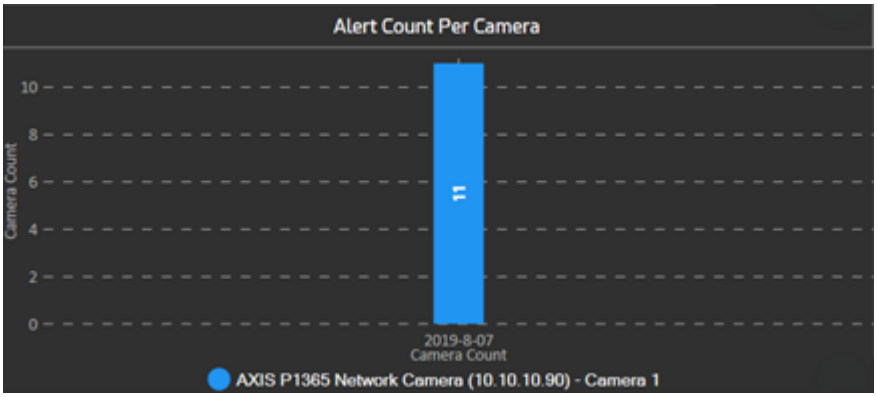


- This chart shows the user how many alerts are triggered per watch list type.

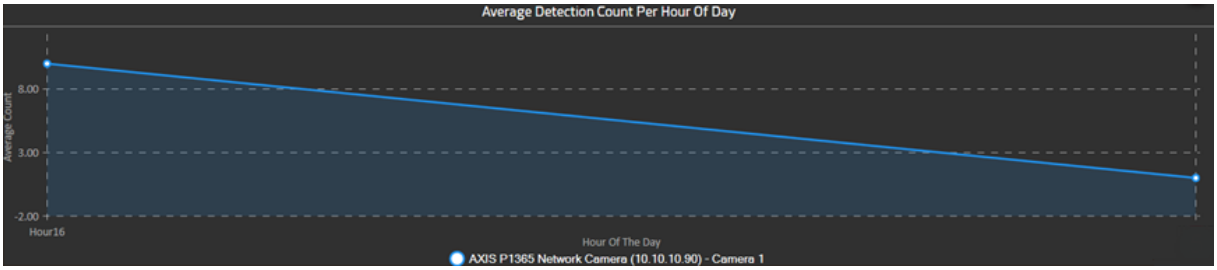


- This chart shows the user watch lists and detections count

- This chart shows the user how many alerts are triggered per camera



- This chart shows the user the average number of detections per day for each camera individually



Camera Filters:

In the window above the user can filter cameras by date. Cameras will appear in the Hierarchal tree in below the time window selected.

4. SOFFAServer Synchronization

To have the Seamless experience, all the Mobile Application SOFFA users are automatically pulled from the online AWS servers to this local server. The pulled License Plates are registered as SOFFA Watch List Type. This is implemented by the following architecture communication:

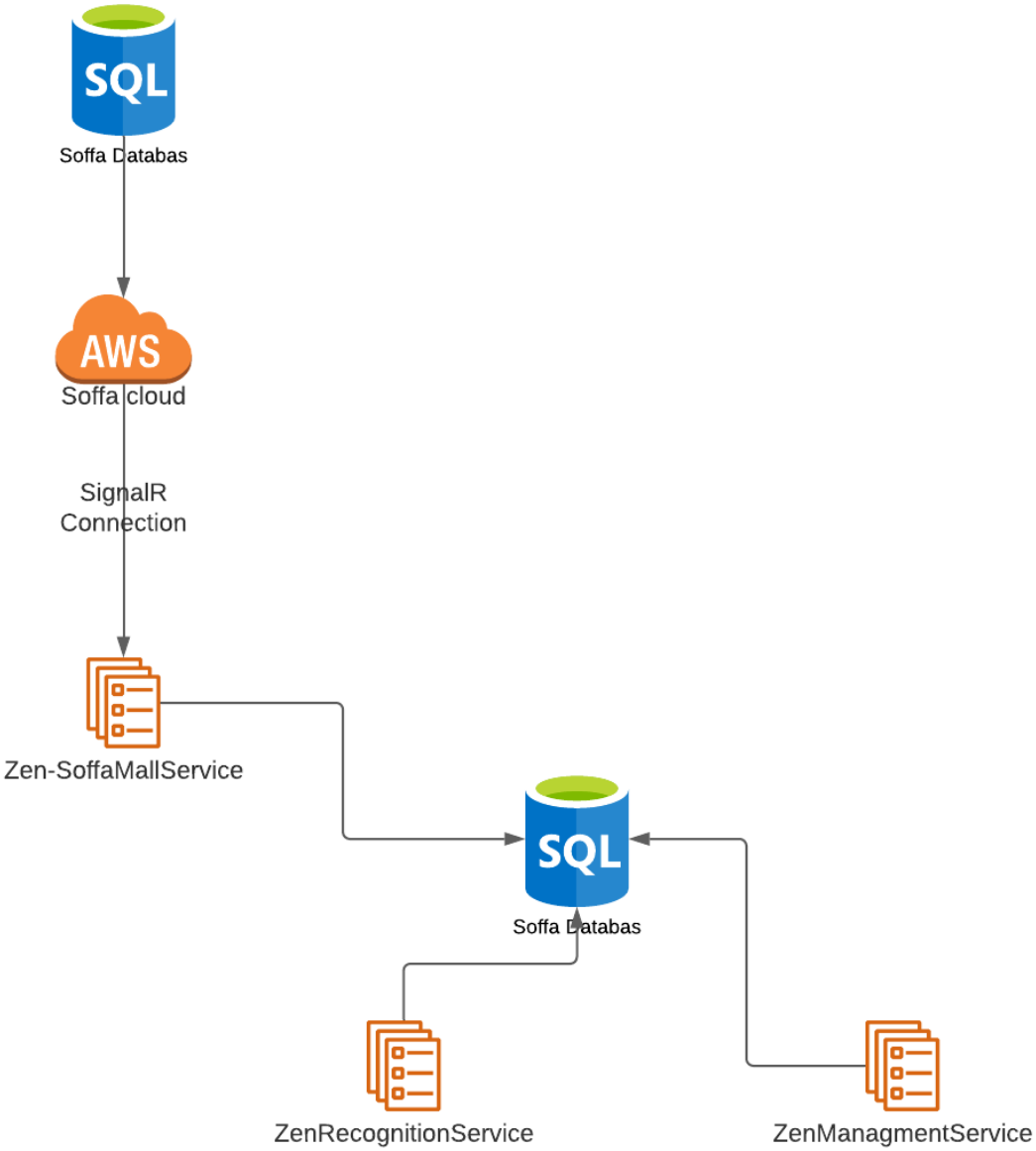
4.1. Cloud Setup

.Net core solution hosted on AWS cloud main purpose to serve end users (IOS and android) and manages data across all venues supported by SOFFA. All data are stored on an SQL database hosted also on AWS and can only be access from the main solution. End users are served using HTTPS Web APIs with tokenization policy applied to all users. Venues connect to SOFFA API solution using SignalR connection which is a secure persistent connection between client (being the venue) and the server (being the solution hosted on AWS). If one of the local servers that are deployed in one of the sites gets disconnect it triggers an alert to our support team to check and fix the issue.

4.2. Venue Setup

Each venue must have 3 services running on its local server:

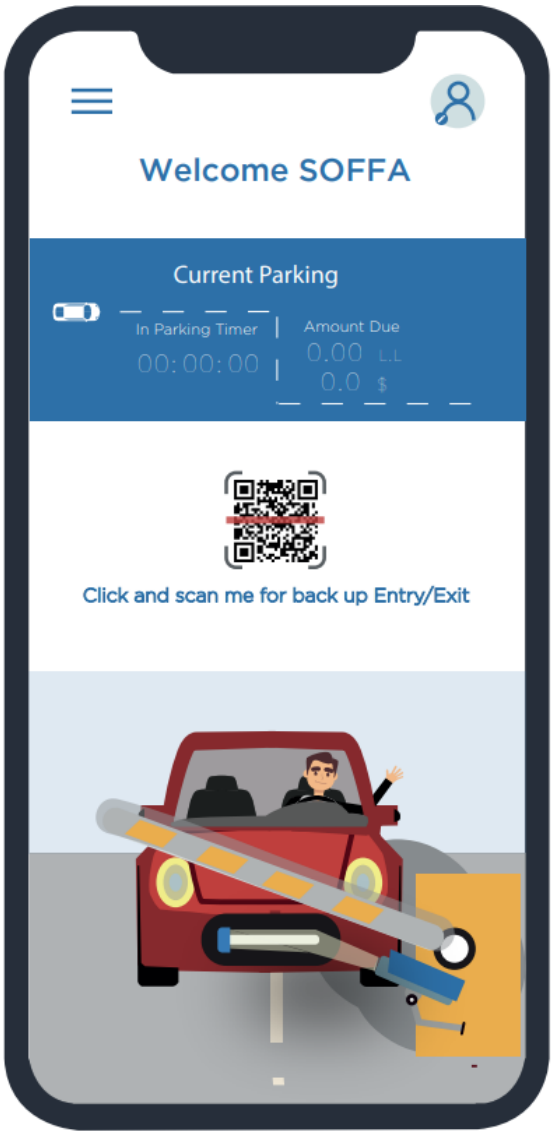
1. Zen Management Service: Zen Management Service is for managing all cameras and their configurations using milestone. Connects to all recognition services to send cameras assigned to it.
2. Zen Recognition Service (at least one): Contains the License plate recognition analyzer LPR, after processing the captured date, it stores them in a local database to be sent to the cloud solution to process them.
3. Zen-SOFFA Mall Service: This is the middleware between the local server in the venue and the cloud server on AWS. The main role of this service to send all plates that are recognized by the recognition service and that are registered on our system. And it also syncs registered plates between the local data with the cloud data. This service provides a contingency plan were if a camera didn't detect a plate that is registered, user can scan a QR code that can be found next to each gate, this it will trigger manual command to the gate to open taking advantage of the persistent connection between this service and the cloud server. Using SignalR it connects to the cloud server. If the online server was offline it will continuously try to connect it until it succeeds. This kind of architecture is used since it provides a loosely coupled structure were if any of the services got down for any circumstances all stored plates will be delivered to the cloud server once everything is back to normal.


SQL
Soffa Databas
AWS
Soffa cloud
SignalR
Connection
Zen-SoffaMallService
SQL
Soffa Databas
ZenRecognitionService
ZenManagmentService

5. Failover System

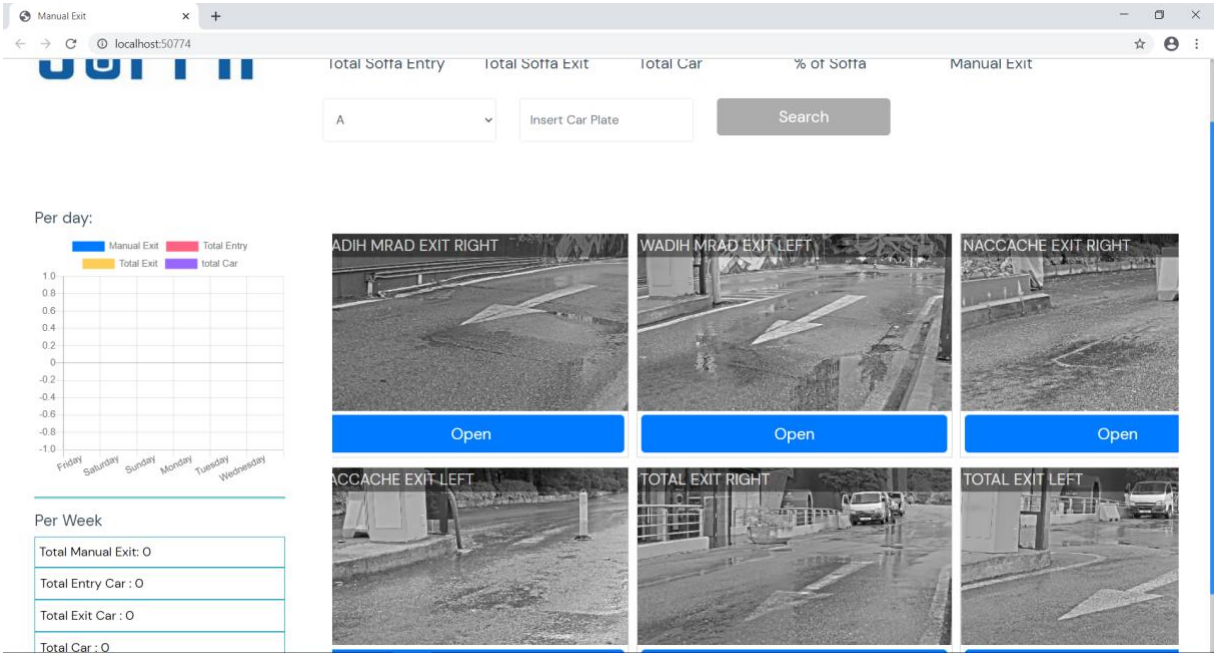
5.1. QR Reader

As the first line of support in case the camera does not read the plate, the user can just scan the QR available next to the camera through the application as shown below. This feature enables the system to be operational without any human intervention, fully autonomous and using the precautionary measures. The mobile device just requests the gate to open via the QR identifier, which in turn requests from the local mall server to open the gate for a specific camera using the FQID of Milestone through the MipSDK communication channel.



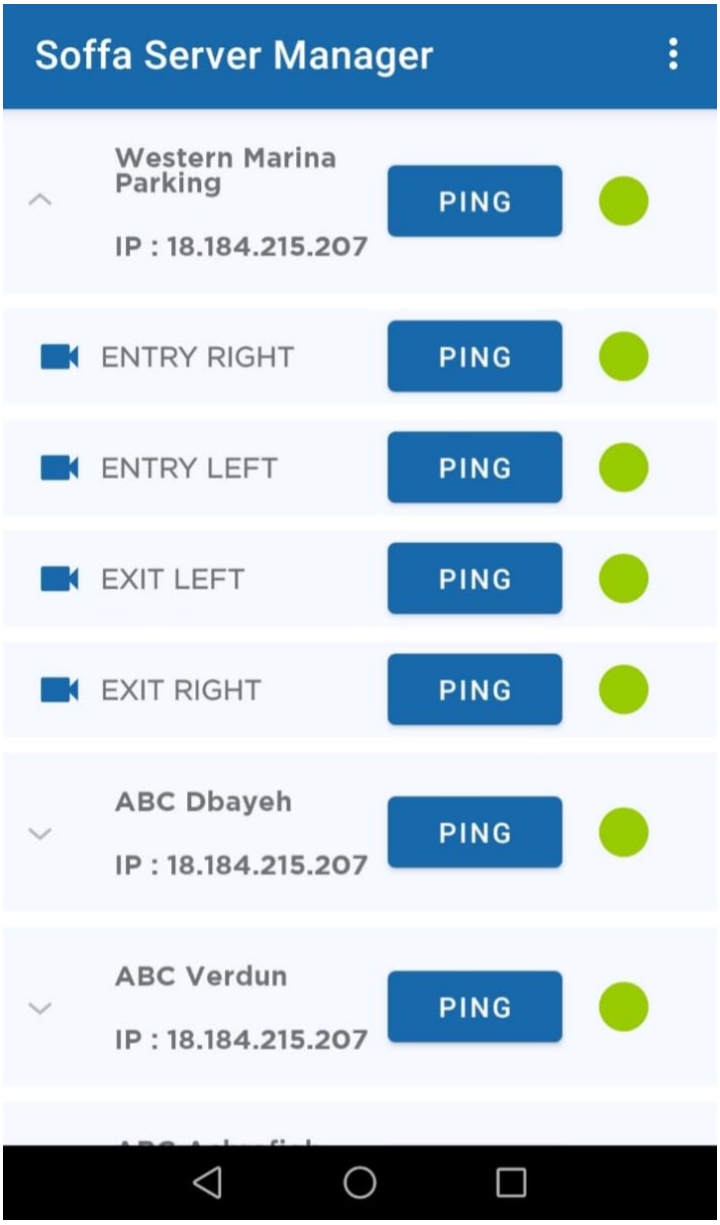
5.2. Manual Exit

As a last resort, parking operators have access to a web application to help assist customers who cannot exit the parking if there is any technical issue in recognizing the plate for any unexpected reason. The web application also provides live streaming of all cameras installed on-site. The streaming of cameras is achieved by using Milestone Mobile SDK, also included is the MipSDK which enables the Output Trigger for a selected camera after validating the driver's plate number.



5.3. Server Manager

Server Manager is the admin tool to keep a close eye on all the servers and services operability along with Milestone functionality and camera statuses using Milestone APIs. In addition to that, utilizing the Mobile SDK to fetch a specific camera feed to check and validate its field of view. Below is a sample image of the Milestone status and the Camera status.


Soffa Server Manager
Western Marina Parking
IP : 18.184.215.207
PING
ENTRY RIGHT
PING
ENTRY LEFT
PING
EXIT LEFT
PING
EXIT RIGHT
PING
ABC Dbayeh
IP : 18.184.215.207
PING
ABC Verdun
IP : 18.184.215.207
PING