VIVOTEK
A Delta Group Company

Deep Learning VCA

User Manual

Document Version: V1.0 / SW version: v7.12 or later version

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- **Coordinate events trigger by VCA**
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Revision History

Doc. Ver.	Deep Learning VCA Version	Release Note	Release Date	Contributor
V1.0	V7.12 or later	1st release	2025/1/15	Emma.Hsia Aaron.Lin

Version and FW Compatibility

Firmware Compatibility	
Deep learning VCA version	Minimum firmware requirement
V7.12 or later	2401 or later version. Example: ✓ 1.2401. XX.XXX ✓ 1.2402. XX.XXX

Glossary

FoV, Field of View	The Field of View (FoV) of a camera refers to the extent of the observable area that the camera can capture.
People/Vehicle Detection Area	VCA model should detection object (human/vehicle) in the FOV with sufficient pixels to recognize. Therefore, the detection area is slightly smaller than the camea FoV in order to meet the minimum detection pixels requirement.
Object	Typically, it refers to “people” or “vehicle” moving within the FoV in surveillance.
	Only in specific application like “missing object detection” or “unattended object detection”, object refer to the thing of interest like a passenger’s luggage, fire extinguisher, or painting.
Object classification	Assigment or Label of object types (person, car, bike, truck or unknown) to tracked objects.
Meta-data	VCA (Video Content Analysis) object metadata refers to the detailed information generated by analyzing video footage of objects to identify and describe objects within the camera's view, especially the location and properties of all tracked objects. These metadata info can be used for object of interest cross-camera or cross-day searching for forensic investigation.

Revision History

Glossary

Frame-based metadata	"frame-based metadata" refers to additional information embedded within each video frame. This metadata include detection and analytic data. It helps in processing, analyzing, and managing video content, enhancing functionality for security, monitoring, and video analytics applications.
VMS	"VMS" stands for Video Management System. It is software that allows users to manage and monitor video feeds from multiple cameras. VMS provides functionalities such as live viewing, recording, playback, and integration with analytics tools. It is essential for organizing, storing, and accessing video data effectively in surveillance and security applications.
Best Shot	"BestShot" refers to a feature that captures and selects the clearest and most relevant images from a video stream.

General Introduction

VIVOTEK, a leading provider in the field of IP surveillance, offers advanced solutions to enhance security and operational efficiency.VIVOTEK Deep Learning VCA contain 2 major functions, “Smart VCA” (Video Content Analysis) & “Vision Object Analytics”. These edge AI capabilities stand out as essential tools in modern surveillance.

- **Smart VCA:** Object recognition and tracking engine for reliable “real-time” security event notification.
- **Vision Object Analytics:** Camera-edge AI analytic for backend “Deep Search - Scene Search, Atribute Search, Re-search” capability.

These edge AI capabilities stand out as essential tools in modern surveillance.

Smart VCA

Smart VCA is VIVOTEK’s advanced technology for intelligent video content analysis that tackles many challenges faced by traditional surveillance systems. One significant issue with conventional systems is the excessive amount of video data and the high rate of false alarm security events, which require extensive labor to monitor and analyze.

Accurate Detection and Recognition

Smart VCA addresses this issue by utilizing a neural network-powered AI to detect and analyze incidents in real-time with high accuracy, minimizing the need for continuous human monitoring. The Smart engine can instantly recognize both humans and vehicles. The main advantage of Smart VCA is its accuracy and reliability. Factors such as changes in light, swaying vegetation, or animal activity in the scene do not trigger events. Only activities involving humans or vehicles that warrant attention will activate an event.

Reduced Management Efforts & Cost

By reducing false alarms and providing precise event notification, it enhances decision-making processes and operational efficiency across numerous applications.

VIVOTEK Smart VCA includes following rules:

1. Line Crossing detection
2. Intrusion detection
3. Loitering detection
4. Face detection
5. Unattended Object detection
6. Missing object detection
7. Crowd detection
8. Parking Violation
9. Restricted Zone
10. Running detection

General Introduction

These features enable the proactive identification of suspicious activities and anomalies. For example, intrusion detection can alert security personnel to unauthorized access in restricted areas, thereby preventing potential threats before they escalate.

The advantages of Smart VCA are evident in its ability to enhance situational awareness and response times. By automating the monitoring process, organizations can allocate their resources more efficiently, focusing on incident response rather than constant surveillance.

The backend Video Management System (VMS) and NVR utilize VCA-tagged events, which significantly reduces the time needed to search for related event evidence to just minutes. By recording videos only when a VCA event occurs, users can minimize both bandwidth and storage requirements. Additionally, detection and analysis are performed directly on individual cameras instead of on a dedicated server. This approach eliminates the need for expensive server hardware and reduces the network bandwidth used for video transmission to a minimum.

Making the Forensic Search Effortless

In addition to providing instant real-time notifications for events or alarms, forensic search capabilities using video recordings are crucial for video surveillance systems. Investigators require careful examination and analysis from multiple cameras to extract vital details about a case and establish a coherent timeline with evidence. Previously, performing cross-camera and cross-day forensic search for persons or vehicles of interest was a tedious and time-consuming process.

Since VIVOTEK Smart VCA detect and tracking people and vehicle, we deployed further “Vision Object Analysis” on the detected object’s images, the bestshot, to extract their features and trajectory as object metadata at the camera edge directly. With these object information, it enable light-speed cross-camera and cross-day search for people / vehicle of interest forensic searching.

How Smart VCA can help

1. Store & Mall Security:

Detecting personnel entering during store closing hours at night.

Detecting customers loitering at the escalator exit.

2. Station Safety:

Abnormal Alarm: More than five people start running in the station hall.

Potent Hazard: Unattended objects left beside the trash can.

3. Railroad Crossing Safety:

Detecting vehicles stuck on the railroad crossing after the barriers have been lowered before a train passes, and providing real-time alerts.

4. Factory Security:

Protects sensitive zones and ensures operational safety, reducing risks of accidents and unauthorized access.

General Introduction

5. Business Building Security:

Maintains a secure environment by monitoring access points and identifying unauthorized or suspicious activities.

By activating proactive monitoring rules on VIVOTEK cameras, operators receive real-time notifications of events, allowing them to identify potential hazards quickly. This enables them to make informed decisions and initiate critical responses to potential threats. These features contribute to safer, more secure, and well-managed facilities.

Vision Object Analytics

Vision Object Analytics is an innovative technology from VIVOTEK that utilizes advanced edge-AI to accurately identify and classify objects within video footage. This capability effectively addresses the challenges of distinguishing between different types of objects, managing time-sensitive investigations, and conducting in-depth analysis. All detection and analysis take place on individual cameras, instead of being processed on a dedicated server. There is no need for expensive server hardware, and the use of network bandwidth for transmitting videos is reduced to minimum.

Object Metadata

Key features of Vision Object Analytics:

- **Object metadata**
  1. Object classification (gender, adult/child, vehicle type,...)
  2. Attribute recognition (color, accessory,...)
  3. Trajectory extraction
  4. Object Bestshot (People/Vehicle Image, Face Bestshot)
- **Derive distinguished feature vector for describing an object's appearance.**
  1. People Face
  2. License Plate of Vehicle

General Introduction

Object metadata enables the backend VMS to discern humans and vehicles, offering valuable insights for surveillance investigations and various industries. The camera-edge “Vision Object Analytics” AI serves as a crucial foundation for the core VIVOTEK deep search capabilities in modern surveillance.

Deep Search Capability

Deep Search is an advanced tool designed to simplify the process of retrieving specific information from large video archives. One of the major challenges in video surveillance is the tedious task of manually reviewing hours of footage to find relevant events. Deep Search tackles this challenge by allowing users to conduct quick searches based on specific criteria, such as object type, color, or behavior.

Key features of Deep Search include attribute search, scene search, and event-based search. These tools allow users to quickly identify individuals or incidents of interest, significantly reducing the time and effort required for investigations. The main advantage of Deep Search is its ability to provide swift and accurate retrieval of critical information, which is essential for timely decision-making and response.

VIVOTEK offers a unique feature called “Re-search,” which is powered by Vision Object Analytics. This function utilizes object feature vectors to enhance proactive security and facilitate timely decision-making. Once users identify a person of interest through deep search, they can use the “Re-search” feature to locate that individual across all VIVOTEK cameras. This function quickly compiles a timeline and path of the person’s movements. Whether for forensic investigations or real-time monitoring, the Deep Search capabilities significantly enhance the effectiveness of surveillance systems.

Note:
For detail VCA-rule, capability, and VMS feature support for different camera model, please refer the VCA quick reference table

VIVOTEK’s Smart VCA, Vision Object Analytics, and Deep Search capabilities mark significant advancements in video surveillance technology. These innovations tackle key challenges like data overload, false alarms, and the need for manual analysis. As a result, they enable organizations to improve proactive security measures, streamline operations, and make informed decisions.

Metadata

Smart VCA detects and track object (person/vehicle) in the scene, the result will display frame-based metadata with video streaming. Real-time Smart VCA event like line-crossing or loitering detection are determined or triggered by frame-base metadata.

After object leaving the field of view, VIVOTEK Vision Object Anlytic will analyze the data for classification and key information extraction. The refined metadata are called “Object Metadata”.

General Introduction

- **Type I, Frame-based metadata**

  The frame-base metadata focus on the the object type (people/vehicle) and position of the object and it's transmitted with video streaming. VMS system can mark the "tracking" block on the real-time video or video reply with saved frame-based metadata record. The real-time tracking determine the event trigger status and it helps user to validate the VCA object detection & tracking on liveview.

Frame-based Metadata

- **Type II, Object Metadata**

  For investigation efficiency, VIVOTEK VISION OBJECT ANALYTICS refines the detected objects passing through the frame, such as people, four-wheeled vehicles, and two-wheeled vehicles. It not only labels the type of these objects, identifies primary colors, detects items carried by individuals (e.g., hat, backpack), but also captures best shot images, along with detailed trajectory information. The object metadata and extracted key features of their appearance as numerical vector are analyzed on the camera's edge and saved into object metadata database after object leaving or disapear from camera's FoV. These information will be saved within object metadata DB in camera and extract key features of their appearance as numerical vector for cross search. VIVOTEK backend system and VIVOTEK VMS plug-in sync the object database with cameras reguarly and ready for deep-search investigation within minutes.

  These info helps backend VMS to filter the object of interest quickly. For example:

  1. Scene Search: Filter the person passing the lane by their trajectory.

  2. Attribute Search:

  Filter the person by gender, color, or belongings.

  Filter the vehicle by type, color, or (upcoming) license plate.

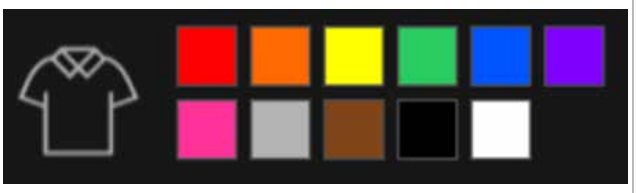
  Note:

  Software partners can also acquire metadata (frame-based or object metadata) from cameras for building various applications. Please refer Ch10 for detail license requirement .

General Introduction

- **Object Metadata – Attribute Label Table**

  People

Category	Types	Note
Gender	Male / Female	
Age	Adult / Child	
Upper Body Color		
Lower Body Color		
Belonging		
BestShots	Body & Face	

General Introduction

Vehicle

Category	Types	Note
Type	Car / Truck / Bus / Motocycle / Bike	
Age	Adult / Child	
Color		No color attribute for motobike.
Best Shot	Vehicle Body	

How Deep Search Utilized Object Metadata DB ?

With object DB from camera-edge analyze, VIVOTEK backend solution can achieves following objectives in general station without expensive and power-consuming GUP server.

1. Backend systems like VAST Security Center (VSS), VORTEX, VIVOTEK NVR, or Genetec MILESTONE with the VIVOTEK plugin can quickly search for target objects, avoiding lengthy video playback after events.

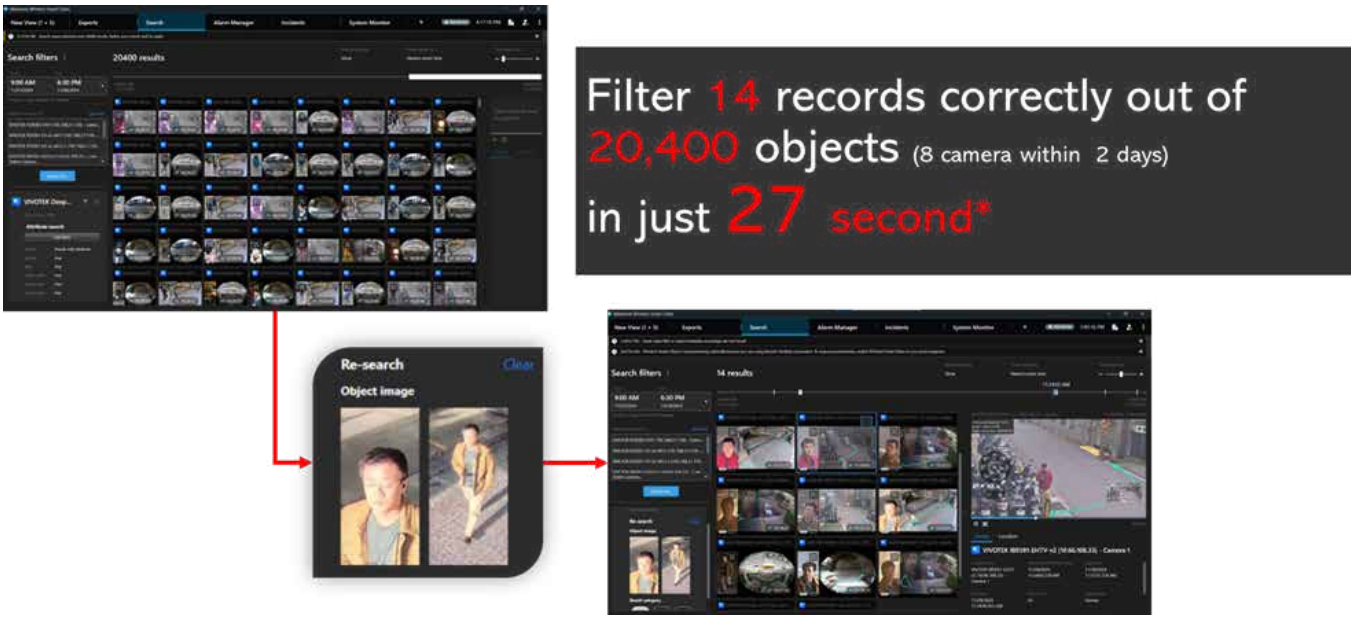
   Users can filter specific behaviors using trajectory information (e.g., intrusion, entry/exit, loitering).

   Filter identified people or vehicles by color and type within a time frame.

   Users can further identify the best shots of targets, quickly identifying potential suspects and reviewing marked video segments to confirm behaviors, greatly accelerating response efficiency.

2. For various specialized backend system or applications, vision object metadata database in camera can be accessed via a license. They are perfect for building application like traffic enforcement, traffic flow analysis, retail customer analysis, and more. VIVOTEK Vision Object Analytics replaces traditional GPU servers in the system, significantly reducing transmission and computation server costs.

General Introduction



Frame-based Metadata

4. For deep investigation on special case, locate the person cross day and camera is critical to build the case profiling and timeline. VIVOTEK provide a unique “Re-search” capability by Vision Object Analytics. The camera edge AI will not only label these objects but also extract their appearance feature vector. That enables the “VIVOTEK Re-search function” that backend system can use the “Re-search” appearance to filter the person or features that looks similar. Therefore, user can pick among the results by their best shot images and building a clear timeline on where the peoson/vehicle of interest shows within the site quick by VIVOTEK Re-serarch function.

Note:

A limited metadata database are within camera’s storage. VIVOTEK backend system (VSS, VORTEX, NVR, and 3rd party VMS plug-in) will query the database regularly. Generally, VIVOTEK backend object database will synced less than 10 mins.

VIVIOTEK backend system will set the time sync with device in camera registration process. Since the timestamp in database are marked according to device time, altering the time sync setting or time zone manually will lead to wrong timestamp for object metadata and incorrect search result.

Limitation

Due to the camera’s storage limitation, long-time network failure will lead to object metadata DB lost since they are covered by new data and backend have not synced due to network failure.

Consideration

While Smart VCA is a powerful tool for detecting and analyzing objects within video footage; however, several factors can impact its effectiveness. The accuracy of object detection largely depends on variables such as camera angles, object sizes, and environmental conditions. The positioning and orientation of the cameras greatly influence the quality of the captured images and, as a result, the performance of the VCA system. Furthermore, smaller objects or those that are farther away can be more difficult to detect with high precision. Therefore, while VCA systems provide valuable insights, it is essential to consider these limitations when designing and implementing them for specific applications.

- **Minimum Object Size in Pixels:** VCA systems typically require objects to be represented by a minimum number of pixels to ensure reliable detection.
- **People/Vehicle Detection Area:** The VCA system defines specific zones within the camera's field of view where object size over the minimum object spec will be detected. These zones can be configured to cover the particular areas of interest, such as entry points or restricted zones, maximizing efficiency and reducing false alarms by ignoring irrelevant areas.

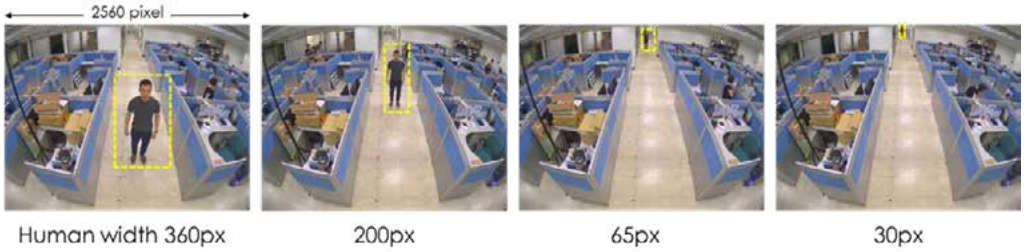
This document provides a general specification for pixel size requirements as a quick reference. Please note that these specifications may vary based on factors such as camera resolution, form factor (e.g., fisheye, bullet, or multiple sensors), and tilt angle. For a more precise indication of the "people/vehicle detection area," For the detail "people / vehicle detection area" for different model and installation (height & tilt angle), please visit VIVOTEK VCA evaluation tool site (https://vca.vivotek.com/). For tool instruction, please refer the UM Appendix.

Camera Installation

VIVOTEK deep learning VCA provide accurate people/vehicle detection function for proactive security surveillance. However, the detection area varies with camera model, installation height, and camera viewing angle (tilt & roll).

Since these 4 installation & setting parameters (height, tilt, roll, focal length) are used to construct the 3D model from 2D surveiliecne image, they each affect the range of human & vehicle detection that match the minimum people/vehicle detection pixels. VIVOTEK Provide a simulation tool website for user to calculate the specific human & vehicle detection area for camera selection and site design phase.

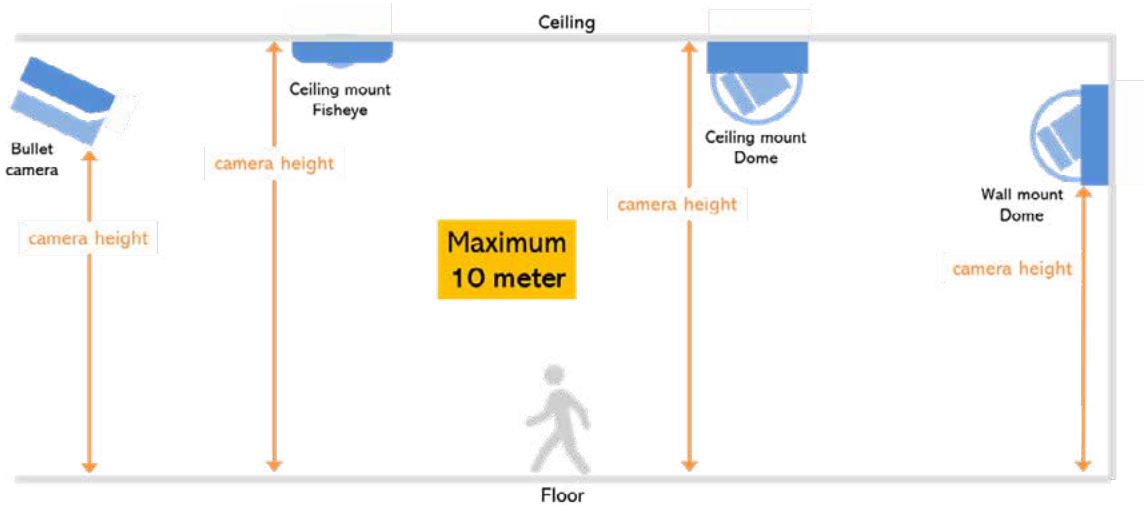
Consideration



These images are taken by a 5-megapixel camera with the body width initially at 360 pixel. As I stand further away, while remaining the same resolution, the width of my body decreases in terms of pixel.

At a certain distance, the pixel density is too low to detect a human movement; therefore, at different set of parameters (height, tilt, rotation, focal length), there will be a boundary to provide effective human detection range.

Height

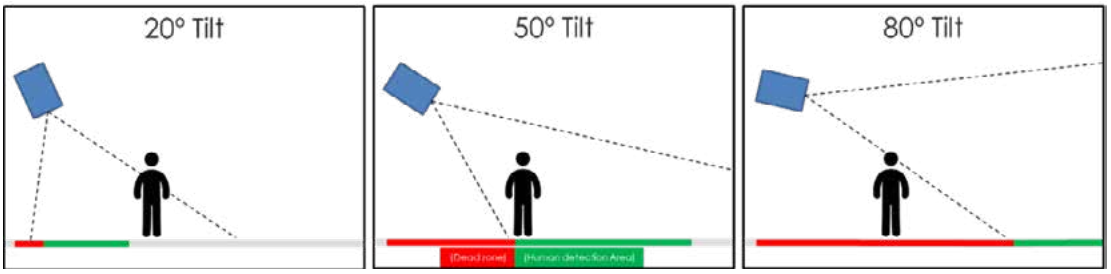


	Bullet	Fixed Dome		Fisheye		Panoramic (Wall Mount)
		Wall Mount	Ceiling Mount	Ceiling Mount	Wall Mount	
Floor to the ceiling			✓	✓		
Floor to the Lens	✓	✓			✓	✓

The maximum supported height is 10 meters. In the case of ceiling mount, either fisheye or dome, that distance is measured from the floor to the ceiling. In the case of wall-mount dome or bullet camera, that distance is measured to the height of the lens.

Consideration

Tilt Angle



The tilt angle discussed here is the angle between the camera and the y-axis.

Red	Green	Gray
Dead Zone Object (People/Vehicle) can not be detected due to viewing angle limitation.	Detection Area There will be sufficient pixels for a standard object in this field for VCA detection.	Out of Detection area The objects are too small for detection.

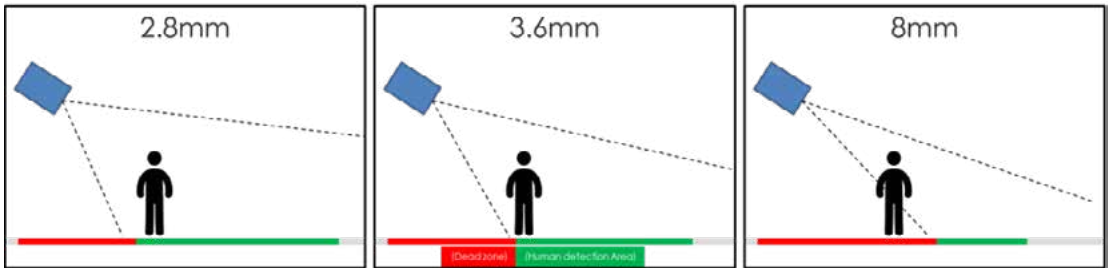
As that tilt angle increases, larger view is available to fit human, so the detection area is extended. However, as we increase the tilt angle, we also increase the dead zone below the camera, this should be considered during the design phase.

Smaller the tilt angle, the less view is available, so there is a smaller floor space to get a recognizable human image. In this case, we can expect a smaller human detection area.

As that tilt angle increases, larger view is available to fit human, so the human detection area is extended. However, as we increase the tilt angle, we also increase the dead zone below the camera, this should be considered during the design phase.

Consideration

Focal Length

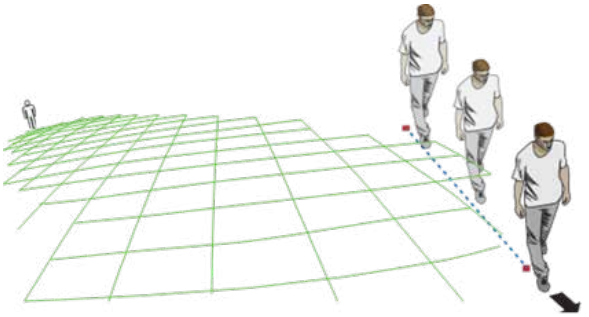


Red	Green	Gray
Dead Zone Object (People/Vehicle) can not be detected due to viewing angle limitation.	Detection Area There will be sufficient pixels for a standard object in this field for VCA detection.	Out of Detection area The objects are too small for detection.

Focal length relates to the field-of-view. Shorter focal length equals a wider FOV; longer focal length (zooms-in) the view and therefore, a narrower FOV. With a narrow FOV, it has a smaller view to fit a full human, so the human detection area will be smaller than a short focal length. Dead zone will increase with longer focal length (or zoom-in). To maximize the precise human detection feature, try to stay with a shorter focal length and install at a closer distance.

Consideration

People Detection and Tracking



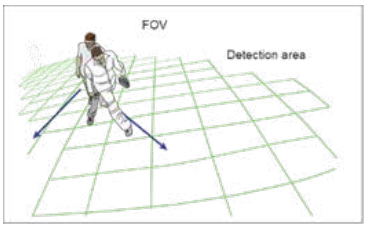
For effective detection, as long as a human silhouette is detected in the field of view, and his feet travelled through the People detection area, he can be detected. Due to the visual perspective of lens, sometimes the entire body may not be fully contained by the detection area.

People Detection Condition		
Minimum Size of Human	5 MP	Min. size: width 32 pix Recommend: 44 pixels (~ 2% of Width)
	8 MP (4K)	Min. size: width 56 pix Recommend: 76 pixels (~ 3% of Width)
Detection number at the same time	Reference: 20 people Note: The spec depends on camera series.	
Attribute Extraction Condition		
Minimum Size of Human	5 MP	Recommend: 60 pix (~ 3 % of Width)
	8 MP (4K)	Recommend: 90 pix (~ 3% of Width)
Minimum illumination	Min. illumination level : 10 lux Recommended illumination level : 50 lux Color recognition is limited to day mode.	

Consideration

Face Detection Condition		
Range of angle	Horizontal: 0° - 60° Vertical: 0° - 45°	
Minimum Size of Face	5 MP	Min. size: width 30 pix Recommend: 60 pixels (~3 % of Width)
	8 MP (4K)	Min. size: width 30 pix Recommend: 60 pixels (~2 % of Width)
Recommended illumination	100 lux	

Limitation on People Detection

People Detection Limitation	
1. Height	The effectiveness of the Smart VCA detection slightly diminishes for objects lower than 130cm, such as children. Persons, bicycles and motorbikes may be confused, especially when seen from the front.
2. Crowded Scene	Due to the optic concave characteristics of a lens, people can be temporarily blocked behind others. When people's head-shoulder feature is concealed, they may not be detected for a short moment. Therefore, their trajectory will be segmented as different object. 
	That will compromise the Smart VCA rule accuracy like line crossing since the trajectory is critical for rule trigger judgement. These trajectory-based Smart VCA analytics are not designed for a crowded scene.
3. Pose	A sitting, squatted, or lying person on the floor may not be detected as a human, because their silhouette have been destroyed. Detection may also be affected when a human form is changed, e.g., a man's body is hidden behind a counter, or a man showing only the upper half of his body by leaning on a desk.

Consideration

4. Recommend planar area for Smart VCA rule setting	VIVOTEK VCA can tracking object in non-planar plan like slpe and User should not setting Smart VCA in non-planar areas like slope, stair, or terraced structure. But these condition will lead to more variance. Therefore, we recommend user set rules on planar area to secure the rule accuracy.
5. Running Condition	If running are expected, following tips should be considered. 1. Set a wider FOV to enable a longer observation time. 2. Use the V or S series camera instead of the entry-level C-series product due to its limited processing power.

Vehicle Detection and Tracking

Vehicle Detection Condition		
Minimum Size of Vehicle	5 MP	Min. size: length 56 pix Recommend: 76 pixels (~ 3% of Width)
	8 MP (4K)	Min. size: width 83 pix Recommend: 114 pixels (~ 3% of Width)
Detection number at the same time	Reference: 20 Vehicles Note: The spec depends on camera series.	
Attribute Extraction Condition		
Minimum Size of Vehicle	5 MP	Recommend: 76 pix (~ 3 % of Width)
	8 MP (4K)	Recommend: 114 pix (~ 3% of Width)
Minimum illumination	Min. illumination level : 10 lux Recommended illumination level : 50 lux Color recognition is limited to day-mode.	

Consideration

Limitation on Vehicle Detection

Vehicle Detection Limitation	
Large Vehicle Classification	Due to the large size of truck and trailer, the VCA recognition accuracy for them is slightly less since they might only show partially in FOV. (EX: Busses and trucks may be confused.)
Vehicle Speed	If fast moving objects are expected, following tips should be considered. 1. Set a wider FOV to enable a longer observation time. 2. Avoid the entry-level C-series product due to it limited processing power.

Requirements for Deep Learning VCA

Condition	Description
1. Lens Clearness	Dust spots or smears on dirty lens can produce miscalculation of pixels, correlation, and movements. Regular clearing must be arranged according to your installation environment.
2. Exclusive area setting for reflective surface	For glass and reflective surfaces (such as aluminum foils) in the field of view, the reflection will lead to false object detection on reflection. False or duplicate event might be triggered. Some other possible sources of interference may include: shadows on the wall, mirrored object image on the reflective surface. User can use the “Exclusive area settings” to get rid of the side effects.
3. Night Mode with IR	In the night mode, the Smart VCA works if additional lighting is provided, e.g., using the on-board or external IR light. Avoid obstructions that can reflect IR lights back to the camera. Color recognition are not support in the night mode.

Consideration

4. Busy area Limitation	In crowded scenes or busy areas, objects can be obscured by others in the images. The performance of VCA object detection, attribute recognition, and tracking may be hindered due to these physical limitations. For busy area, user should deploy multiple surveillance cameras from different angle for securing the capture rate.
5. Eliminating uncertainty	To reduce false or missed alarms, unnecessary objects within the field of view should be avoided. Items such as doors, floating curtains, and moving objects like escalators can lead to detection errors.
6. Camera model selection for busy area	Due to the edge computation power difference and limitation, entry-level camera models of VIVOTEK C-series are not suitable for main entrance or busy area surveillance.
7. Configuration web console Loading	Due to system loading consideration, do not open two configuration web consoles at the same time during VCA or streaming performance validation.
8. Weather	Detection accuracy can be affected by severe weather, such as heavy rain or fog since the object visibility is compromised.
9. Vibration due to bad mount type or position	Ensure the camera is properly mounted. Excessive vibration, such as that when mounted on a thin or unstable pole, can affect the detection accuracy.
10. Background Contrast	Contrast between the object and the background cannot be too low. A black car in a very shaded area may not be detected.

Consideration

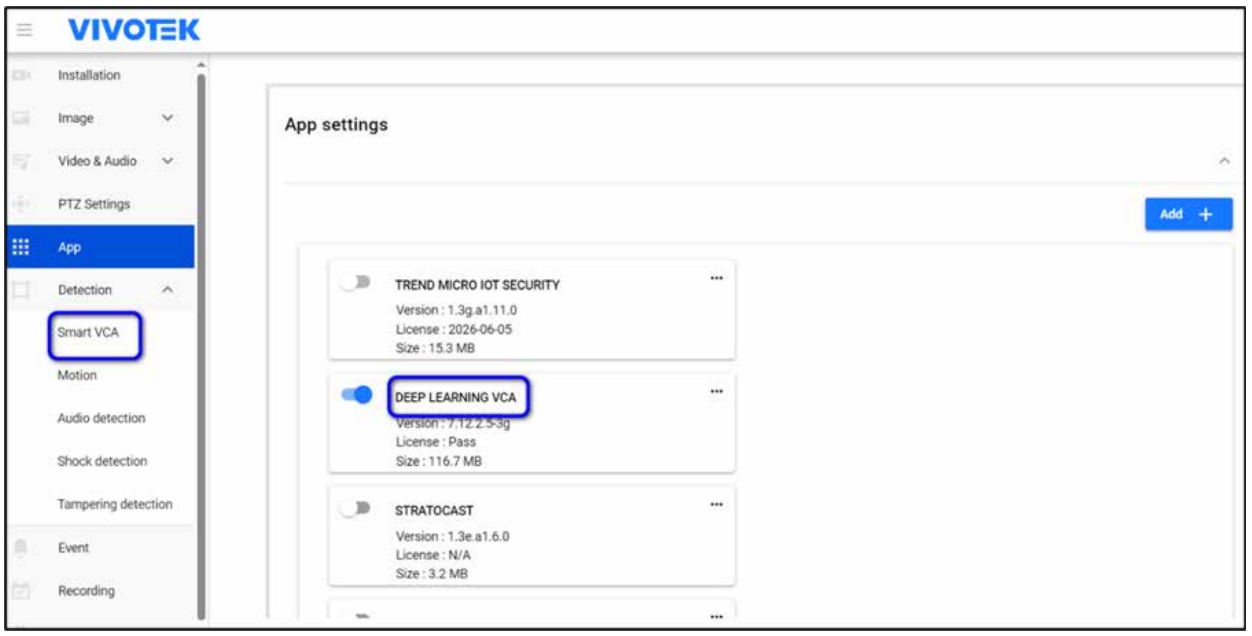
Limitation on Browser

LIMITATION	
Web Browser	1. VIVOTEK camera officially support “Google Chrome 58.0” or above. 2. Microsoft Edge browser is included, too. 3. IE browser is removed from the web browser option along with the Microsoft IE EOL notification.
Streaming Format	H.265 streaming format are not supported on Chrome and Edge browser. For configuration web console, user must set at least 1 streaming in MJPG or H.264 format for live viewing on configuration web console.

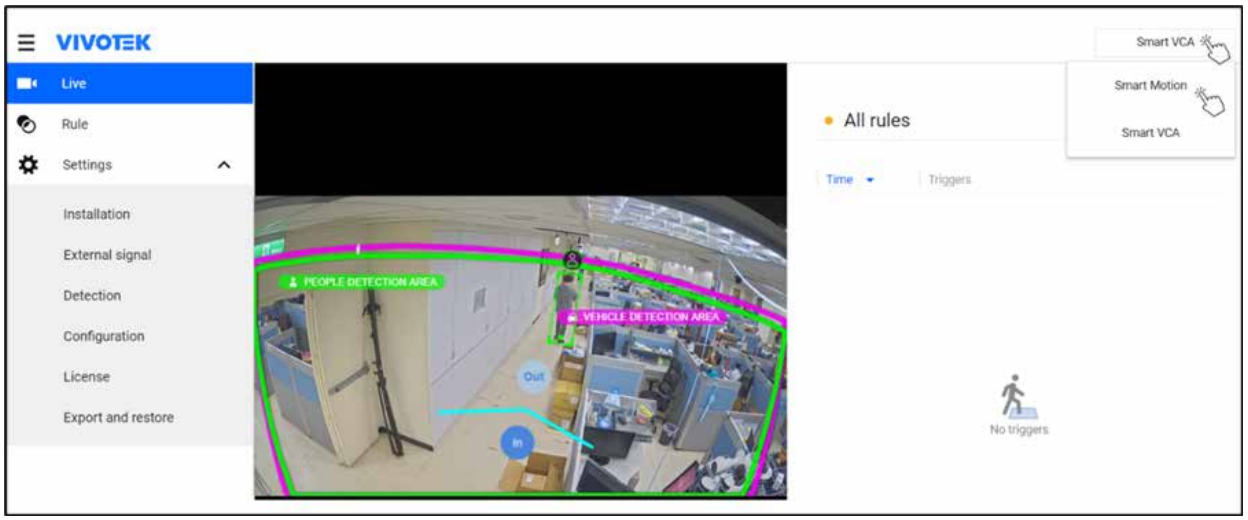
Start using the VCA

How to access Smart VCA

There are two ways to access Smart VCA on the camera web console. One is through the Deep Learning VCA package on the App page, and another is through Smart VCA tab in the Detection. Access Deep Learning VCA package to open the monitoring and configuration page.

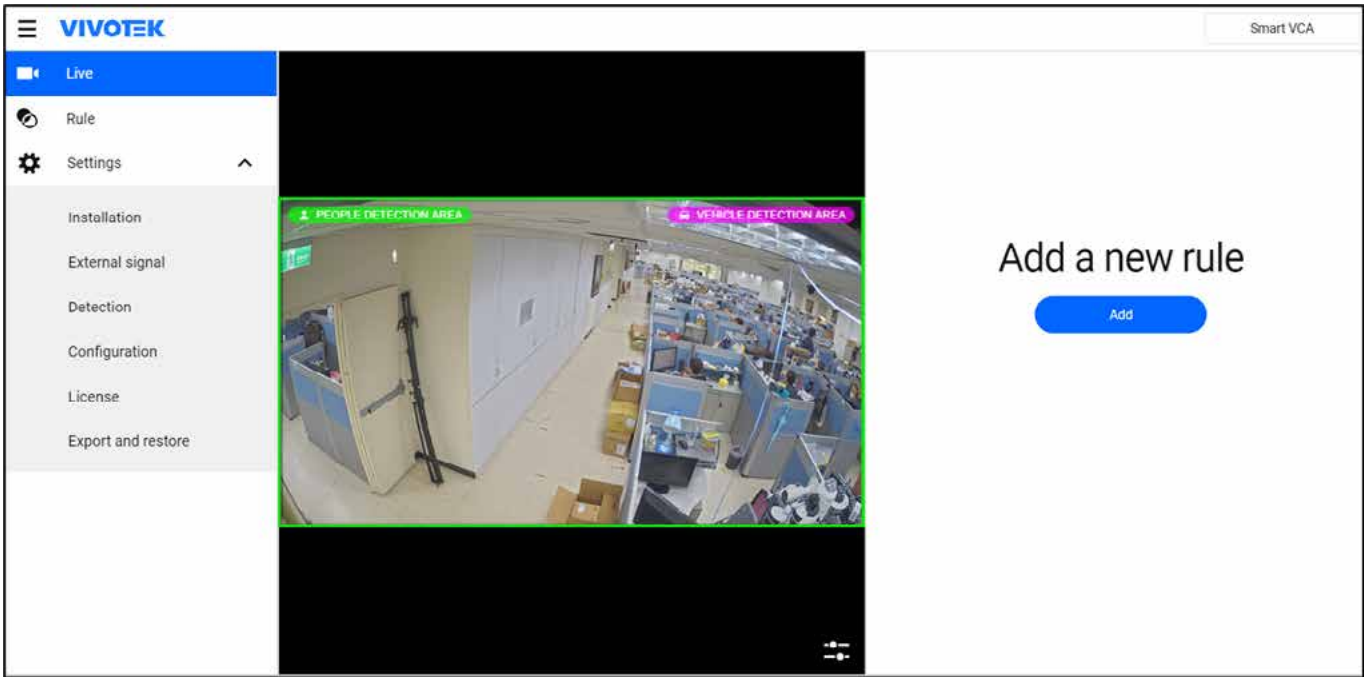


Smart VCA and Smart Motion share the same package; the tab at the top of the right can switch between them. If you go from the Smart Motion detection link, you will enter the Smart Motion main page. If you go from the Smart VCA link, you will enter the Smart VCA page directly.



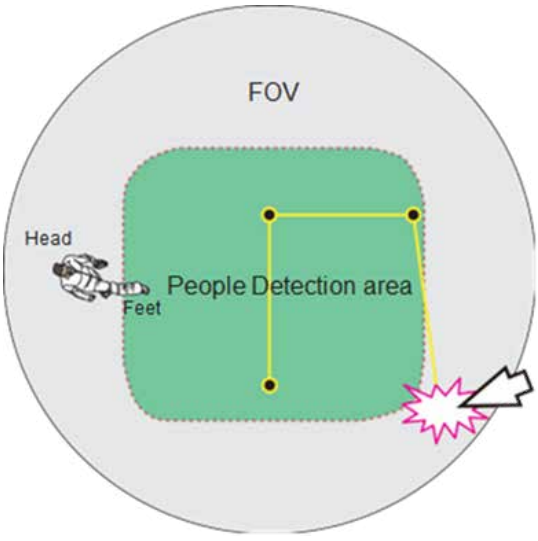
The live page will show whenever accessing the Deep Learning VCA package. The people detection and vehicle detection areas indicate the boundaries within which effective people activity detection can occur, and it will be on full screen the first time the Smart VCA is accessed. The camera will calculate the detection area based on its installation height and tilt/roll angles, and it will adapt to the floor area under Auto mode after a while; a rule can be added under either situation.

Start using the VCA



Due to the camera's visual perspectives on the ceiling, a person enters the scene from the edge of the FOV with his feet appearing first and head later; the head and feet positions can only be aligned until the person is within the detection area.

The Detection area of fisheye camera running a Smart VCA package is shown in below picture. The vehicle detection area is slightly different from the human detection area, and different algorithm is used.

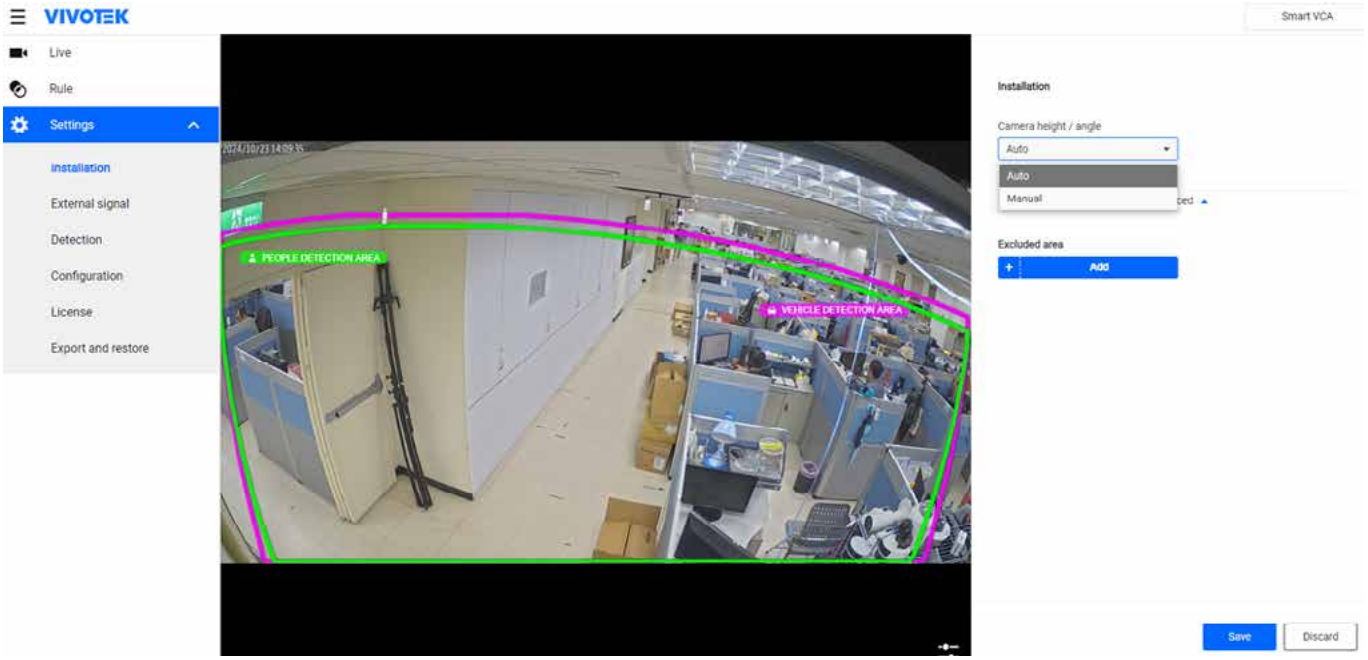


Start using the VCA

Installation

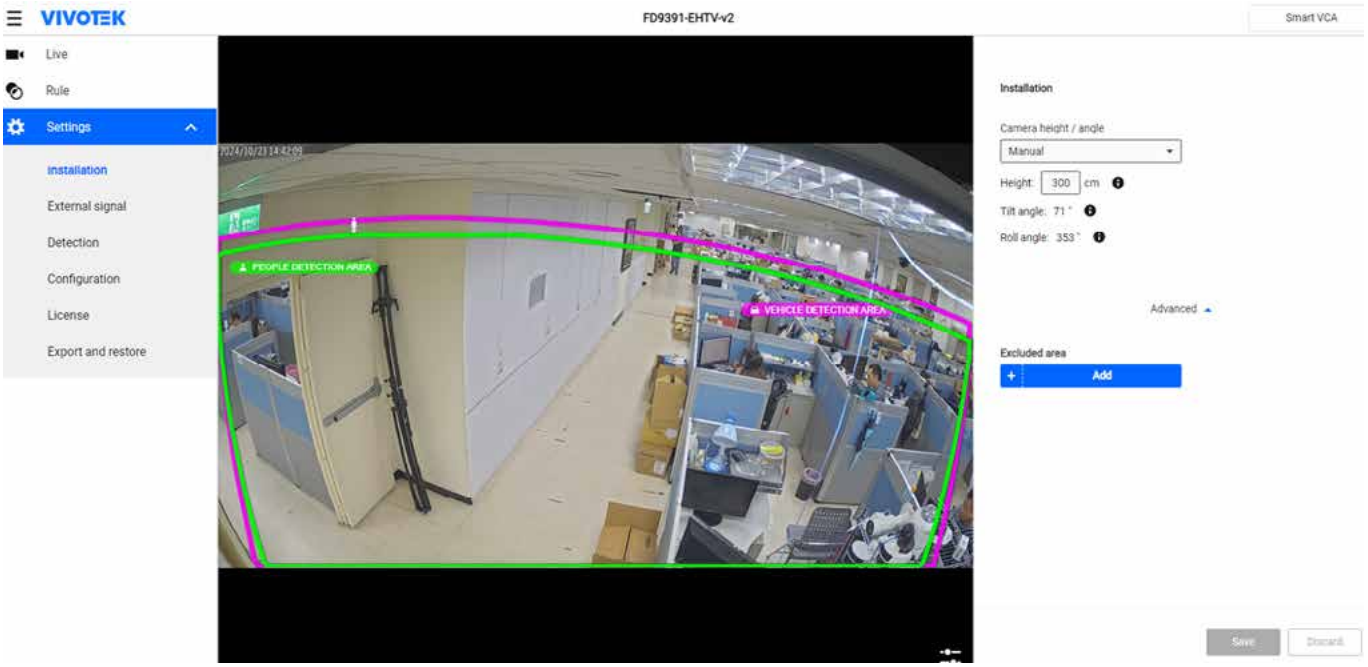
The Settings page provides the generic tuning options, and the Smart Motion detection and Smart VCA share the same setting parameters.

In the installation setting, there are two modes: auto and manual. Many VIVOTEK cameras are equipped with a G sensor, which facilitates automated calibration to adjust the camera's angle in auto mode. The Deep Learning VCA AI model detects the camera's height, allowing users to simply install the camera and set the rules without worrying about the installation process. Initially, the detection area will cover the full screen until the AI model determines the camera's height. Once calibration is complete, the detection area will shrink to the floor area to enhance accuracy.

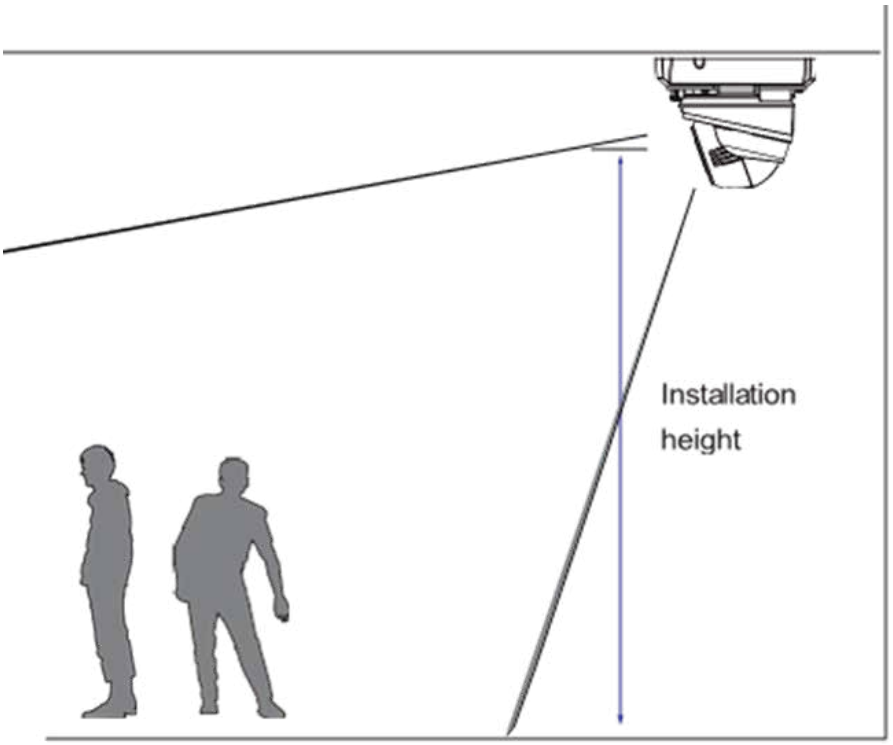


We keep the manual mode for users who prefer not to wait for the AI to learn. If you are using devices that do not have a G sensor, you can manually enter the tilt and roll angles. Once you have entered the values, please click the Save button to finalize your changes.

Start using the VCA



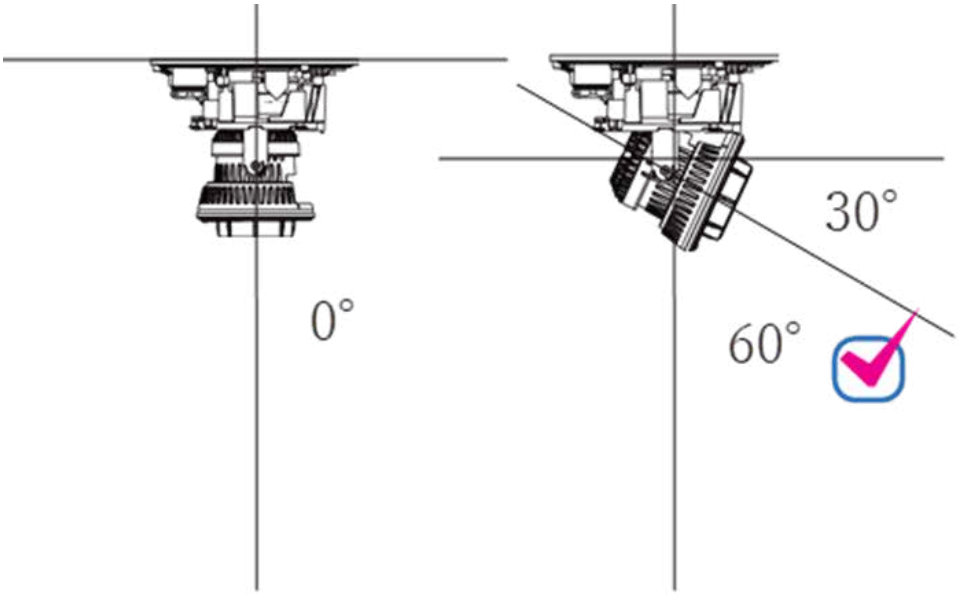
IMPORTANT:
Ensure that you accurately measure the height of your camera while in manual mode. This height information is crucial for achieving accurate video analytics results, as it allows for horizontal and vertical keystone corrections of the field of view. Measure the distance from the ceiling where the camera is mounted to the ground.



For bullet cameras or wall-mounted domes, measure the distance from the lower edge of the camera canister to the ground.

Start using the VCA

Note that the tilt angle correlates to the absolute downward direction. If a camera is installed on a ceiling, and its lens points straight downward, its tilt angle is 0 degrees. If your camera lens is tilted, enter the angle related to the vertical line, e.g., 60° as shown below. The roll angle refers to the horizontal level line.



Start using the VCA

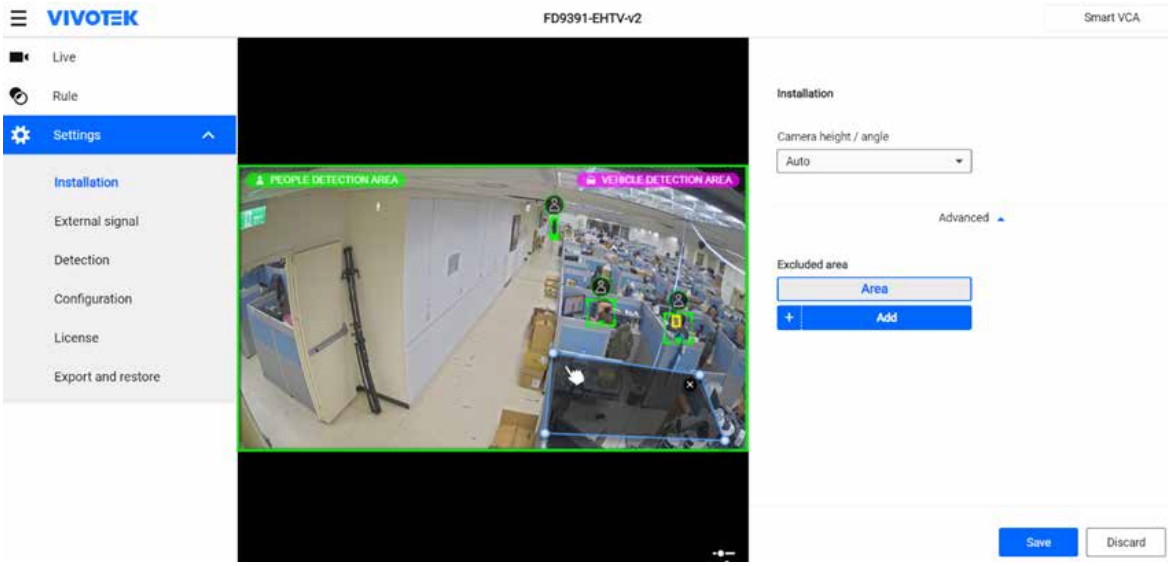
Excluded Area

Sometimes, there are non-related elements in the camera's field of view, such as a white wall where no one can walk or a fishpond with a reflective water surface. You can add excluded areas to block out the unnecessary elements that might affect the correctness of video analytics in the scene.

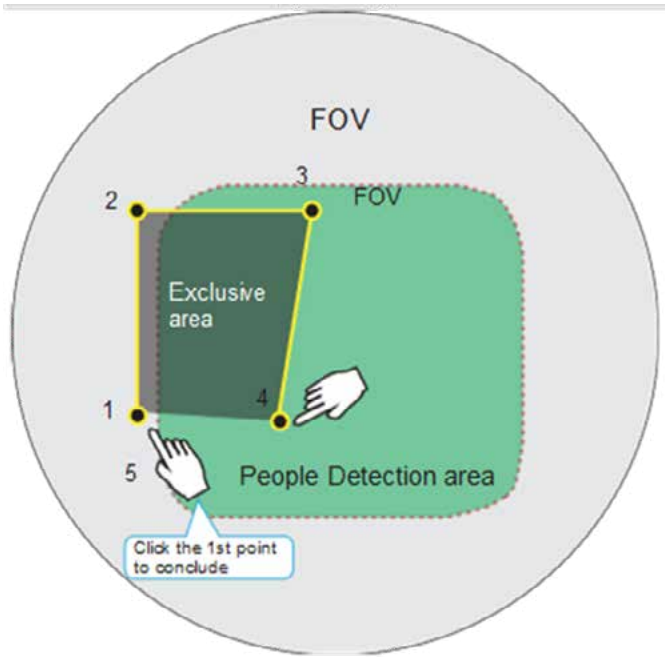
Click the Add area button  to add an Excluded area.

To create Excluded areas, use mouse clicks on the screen to draw polygons. Click Save to preserve your settings. Up to 20 clicks can be used. A minimum of 3 clicks are required for an excluded area. You can also double-click to conclude an area.

To delete an area, click the cross sign  on the area.



Note:
An Excluded area can be placed outside the people detection area.



Start using the VCA

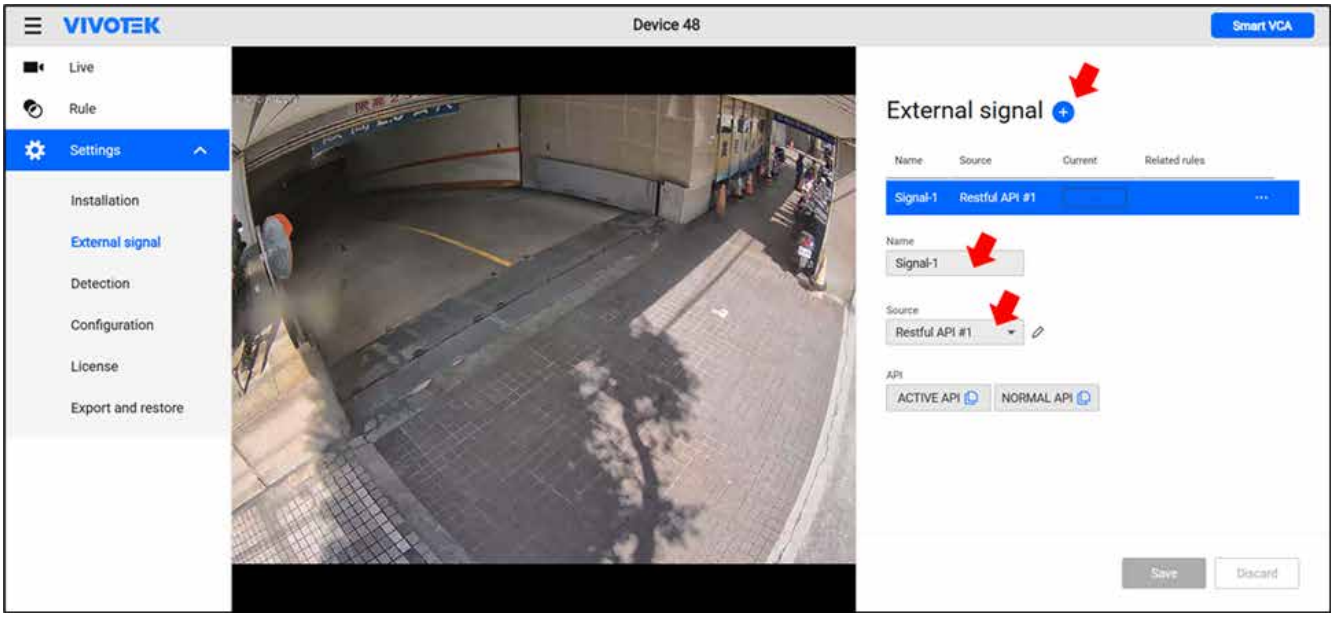
External Signal

For specific application like “level-crossing monitoring”, user need to couple the VCA monitoring with external infrastructure status. User can utilize the “external signal” setting to fulfill the application requirement.

External signal can activate VCA rules as an advanced trigger condition. For example, a line crossing detection or parking violation rules set at a level crossing are only active when the crossing barrier is down. Similarly, a line crossing detection at an intersection is only active when the traffic light turns red.

Add External Signal Options

Before setting the rule, user must add the “external signal” in setting. User can define “name” for the external signal, and choose the “Source” from option list.



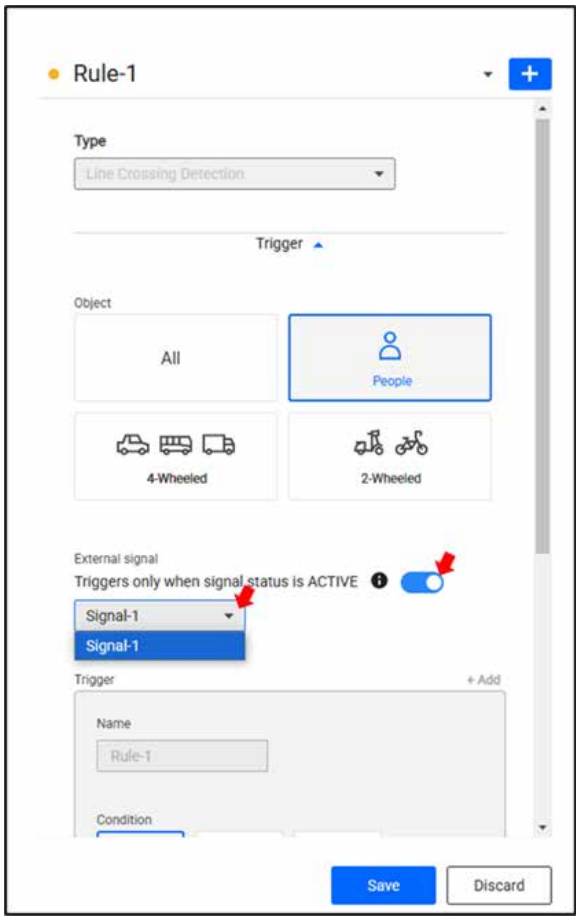
Start using the VCA

Source Options

Options	Number	Note
Digital Input	Depend on Camera Hardware	If the camera is without DI, the option will be hidden.
Restful API	3	User can directly copy the API from UI for easy integration.

Rule Trigger Setting

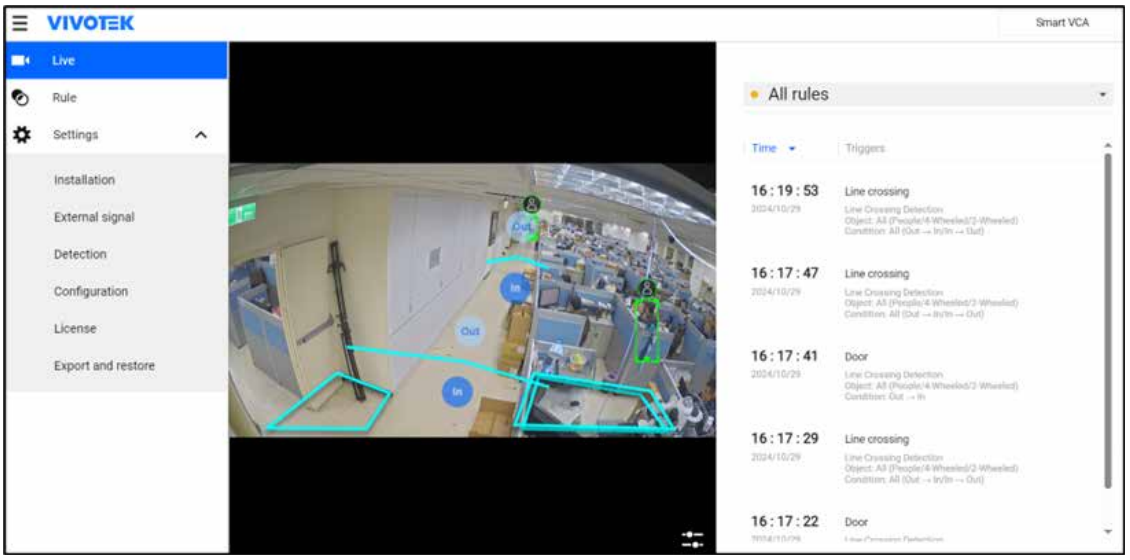
Once the external signals are set, user can active the “external signal” trigger option. The pre-defined option will be available to choose.



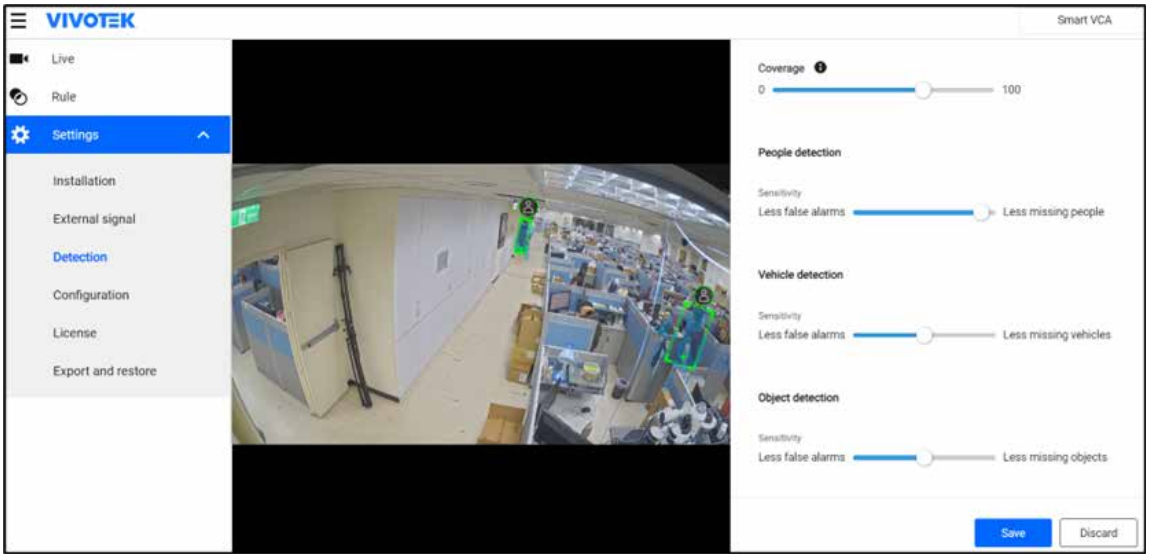
Start using the VCA

Detection

The VCA detection results appear immediately on screen (depending on the activities and inputs in the scene).



In **Settings > Detection**, the VCA sensitivity settings can be tuned if detection does not perform as you expected. Note that these Sensitivity parameters are shared between Smart VCA and Smart Motion detection.



People detection, Vehicle detection, Object detection: In real-world applications, the effectiveness of VCA detection can be affected by the following:

Fast-moving, running in the scene,

Lingering at the edges of FOV,

People crouching or crawling.

Start using the VCA

In such situations, users can consider tuning the sensitivity towards “Less missing objects,” vehicles, and people.

On the contrary, if tuned towards “Less false alarms,” the detection algorithm will apply more strictly human or vehicle silhouette matching. In some situations, such as when a man crouches to pick up an object, he will be temporarily undetected. With a live view, you can observe the effectiveness of People detection on screen.

Configuration

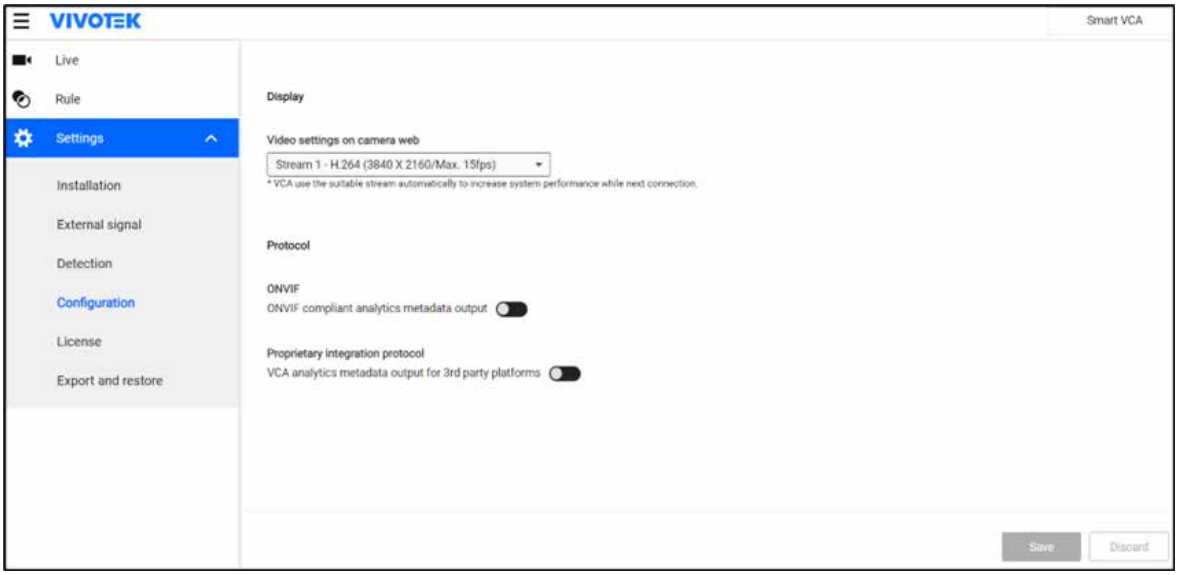
Display

You should select a video stream your client-side uses for live viewing. Otherwise, the subject camera will have to deliver another video stream, e.g., Stream 1 + Stream 2, causing increased loading on the camera.

If streaming 1 is 5MP full resolution at 30fps, it is used for video recording and the VCA package uses stream 3 full HD 30 fps, the camera will have to handle stream 1 5MP 30fps + stream 3 full HD 30fps, which causes higher CPU loading. Therefore, it is recommended that the same stream be used for viewing, recording, and VCA analytics.

Protocol

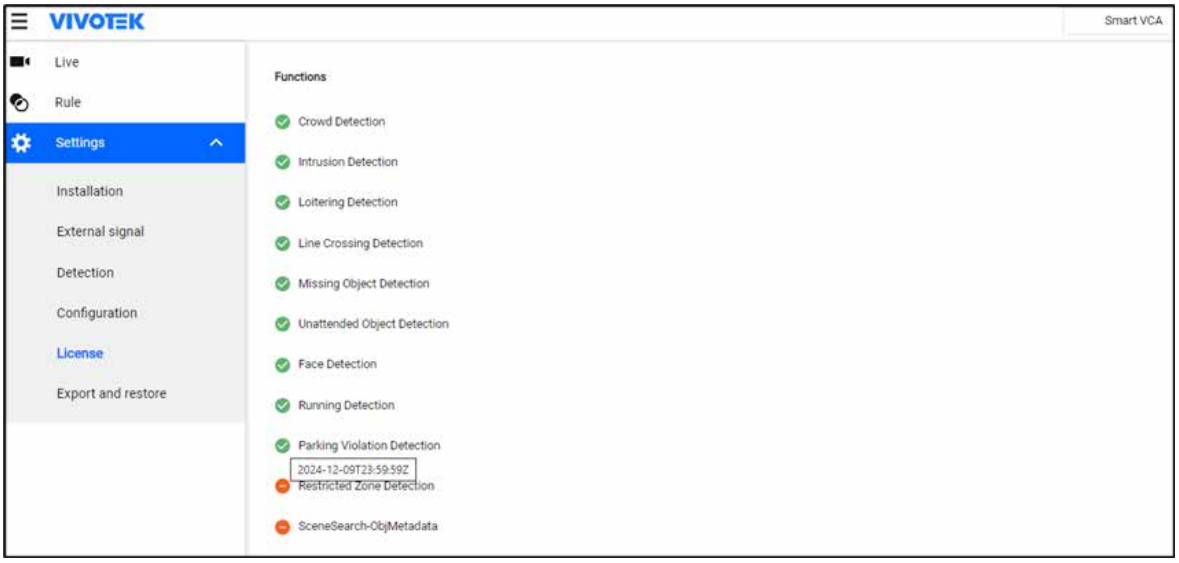
The ONVIF option is selected when you need to display detection details (frame base metadata) on 3rd-party software, such as Milestones and Genetec. The metadata is sent to the VMS using the ONVIF protocols. Another option is for the analytics data to be ported to a 3rd-party platform, displaying detection results on video management software.



Start using the VCA

License

The license page provides a detailed overview of the status of each rule and function. When you hover your mouse over the icons, the available time will be displayed. The ObjMetadata functions included in the license are specifically designed for third-party software. However, VIVOTEK back-end products do not require a license to perform searches.

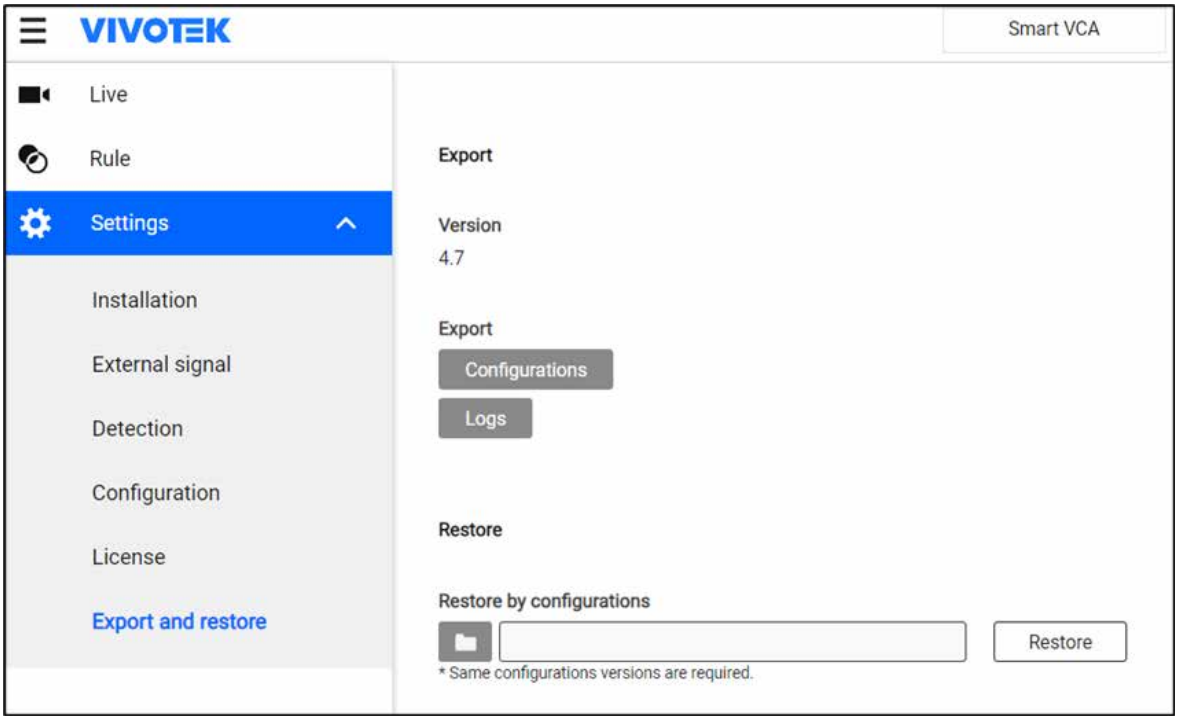


Start using the VCA

Export and restore

The **Export & restore** page can save the VCA configuration as a file. Sometimes, the configuration file can be repeatedly used on different cameras. For example, when you install many cameras at the doors of train carts, one configuration file can be used on several cameras since the camera positions to the door should be identical.

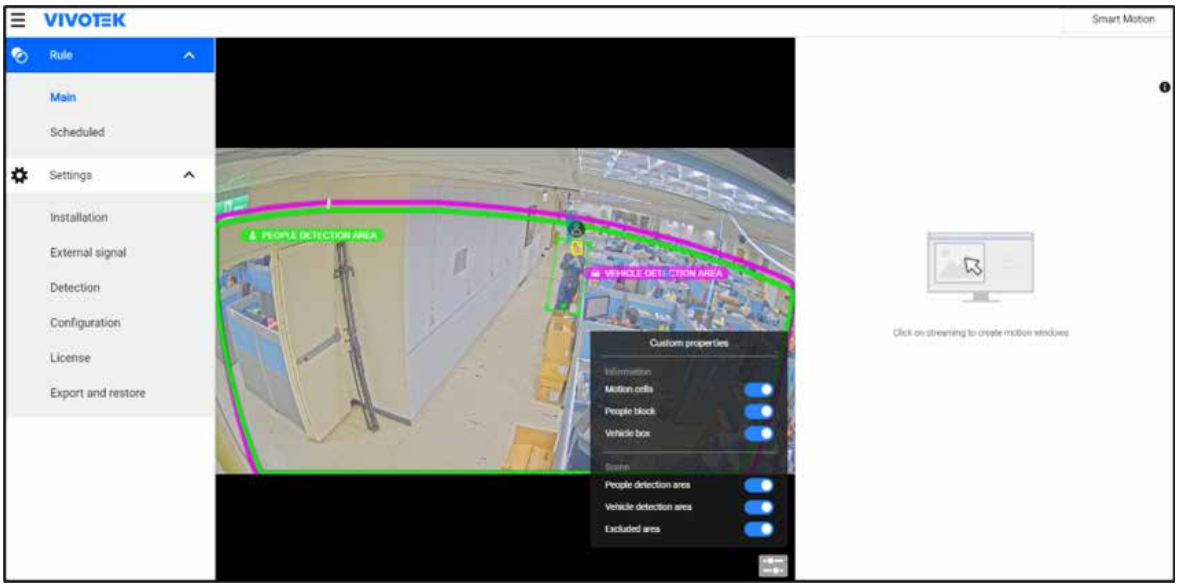
The VCA system log and configuration file are required for debugging or detailed troubleshooting.



Start using the VCA

Smart Motion

The only difference in display options of live view between Smart Motion and Smart VCA is Motion cells, which share the same detection setting as Smart VCA.



Observe the human traffic and tune the Coverage until the motion cells match the human figures on the screen. The same applies if you aim to detect larger objects like vehicles. Tune the Coverage so that the appearance of motion cells better coordinates the appearance of the objects of your interest.

Coordinated	Not enough cells	Excessive cells
		

Start using the VCA

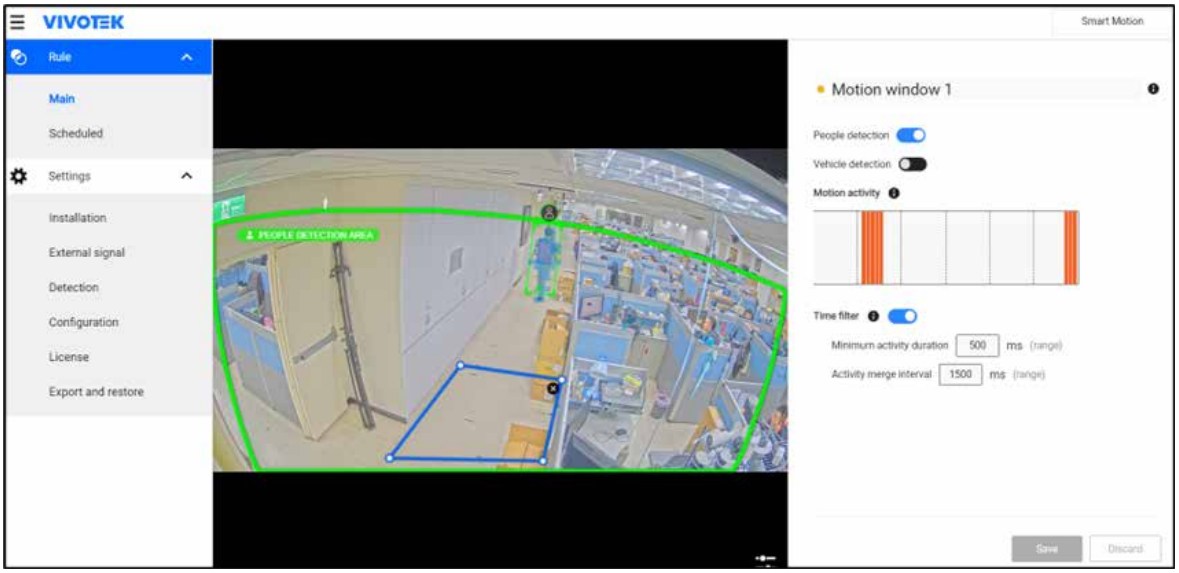
A real-world view of excessive motion cells is shown below. The higher the Coverage, the higher the chance of generating more motion cells.

Below is the comparison of the same object detected through different Coverage levels. Excessive motion cells can be observed at the Coverage level 90, while at level 30, the detection ends up with insufficient motion cells.

Coverage: 90 Coverage: 30

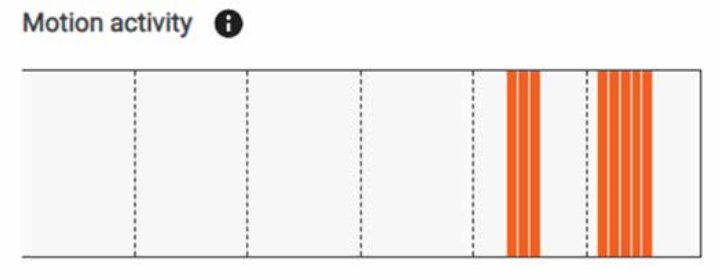
People / Vehicle detection: This toggle turns the People/Vehicle detection feature on or off. When People/Vehicle detection is disabled, motion activity configuration options will differ.

With a live view, you can observe the effectiveness of People detection on screen.



Start using the VCA

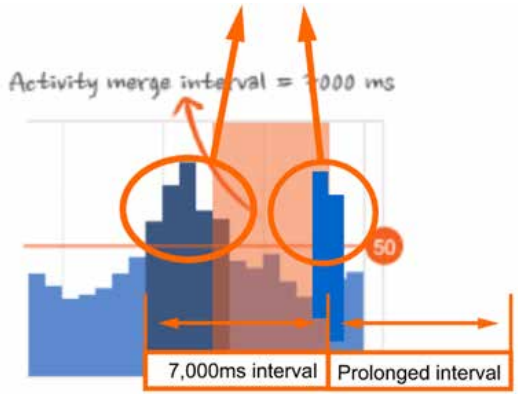
Motion activity: The detected human activities are displayed on a 1-minute timeline. The 3 consecutive orange lines indicate a detected presence persisted for 3 seconds.



Time filter - Minimum activity duration: A human activity (or moving objects) must persist for longer than this duration to be considered an effective trigger. This aims to avoid the situation when one enters and leaves the scene very quickly.

Time filter - Activity merge interval: Setting this interval aims to avoid the stop-and-move maneuver by some thieves. The activities that occurred during this duration are considered as one trigger. If activities occur before the end of the interval, the interval will be prolonged, e.g., 7 + 7 seconds.

If activities occur before the end of this interval, the inconsecutive actions will be considered as one trigger.

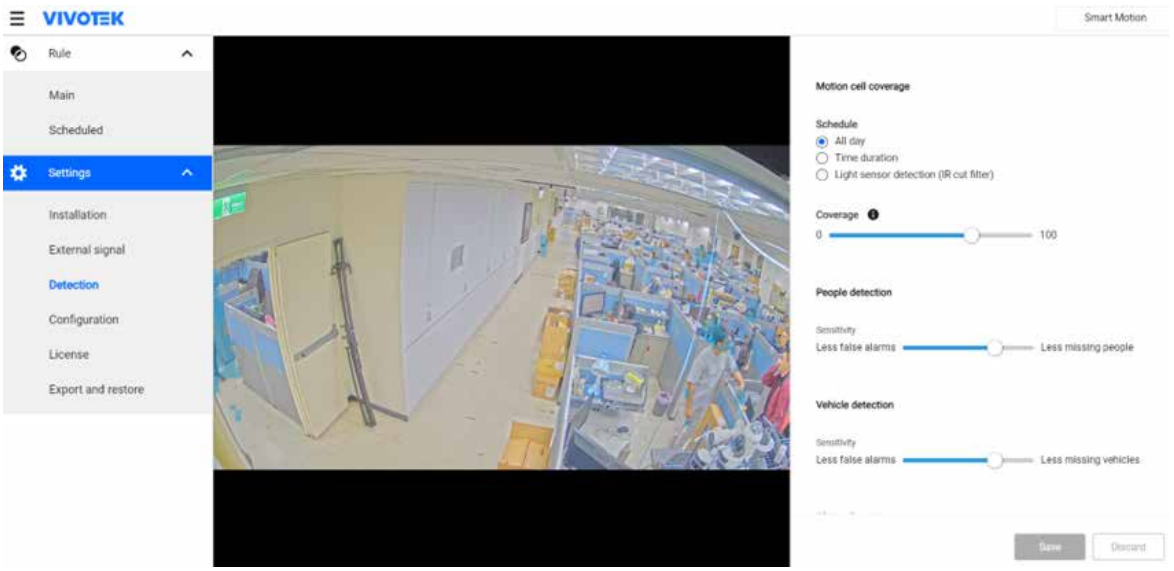


Start using the VCA

Detection (Smart Motion)

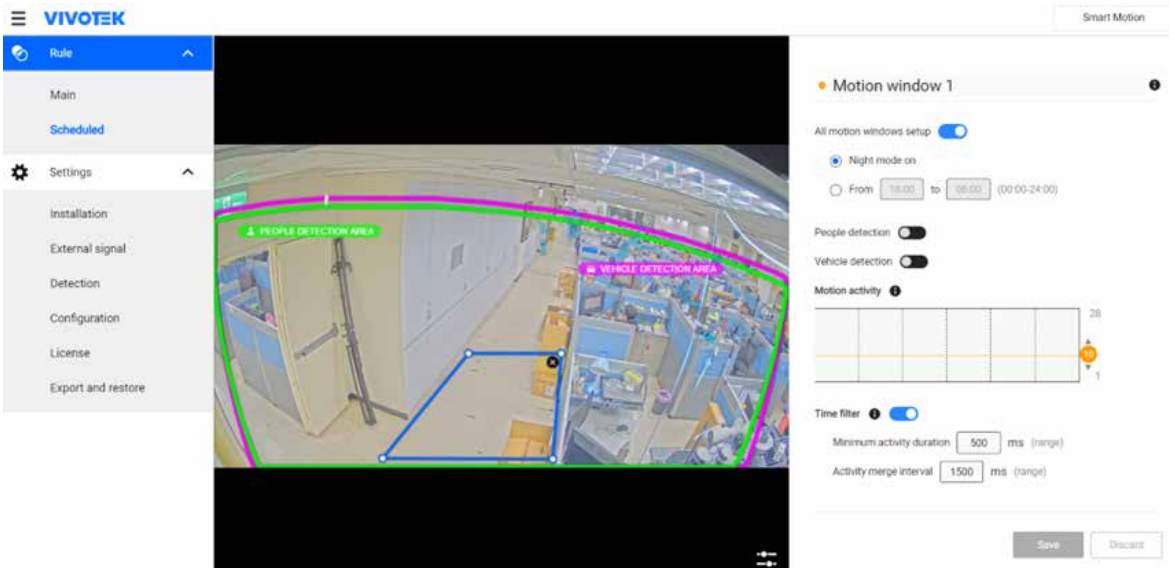
Tune the following setting if the need should arise.

Motion cell coverage: Use the slide bar to change the coverage. The default is 70%.



Schedule (Smart motion)

You can select to enable a Night mode to accommodate different lighting conditions in the day and night scenes. If the need should arise, you can specify the duration of the night mode.



Configuration the Smart VCA Rule

A major pain point in conventional video surveillance systems is the overwhelming volume of video data, which is labor-intensive to monitor and analyze. Smart VCA solves this by NN-engine powered AI detecting and analyzing incidents in real-time accurately, reducing the need for constant human oversight. The primary advantage of "Smart VCA" lies in its accuracy and reliability. By reducing false alarms and providing precise event notification, it enhances decision-making processes and operational efficiency across numerous applications. Here's the use case and benefit for different scenes that give us the big picture on the advantage of Smart VCA rules.

Rule Setting User Interface

Live View Windows

The windows displays following information.

1. All existing rules
2. Custom Properties – Scene
   People Detection Area
   Vehicle Detection Area
   Exclusion Area
3. Object Tracking Box

Non-shaded area for rule setting guide

For rules like "line crossing" and "intrusion", the crossing line determination of an object is the key to the rule triggering judgment.

Live view windows will show shaded area to guide user. We highly recommend user to set rule monitoring area within the non-shaded area in order to keep sufficient room to object (people/vehicle) detection limitation. That can secure the tracking start before crossing the time for VCA accuracy.

Configuration the Smart VCA Rule

Custom Properties

Information	
People Block	Show the real-time human tracking position by box indicator on live streaming.
Vehicle Block	Show the real-time vehicle tracking position by box indicator on live streaming.
Scene	
People Detection Area	It indicate the human detection limitation that meet the minimum pixel requirement in current camera setting & pose.
Vehicle Detection Area	It indicate the vehicle detection limitation that meet the minimum pixel requirement in current camera setting & pose.
Excluded Area	Show the excluded area defined in VCA “instllation”.

Rule Setting Area

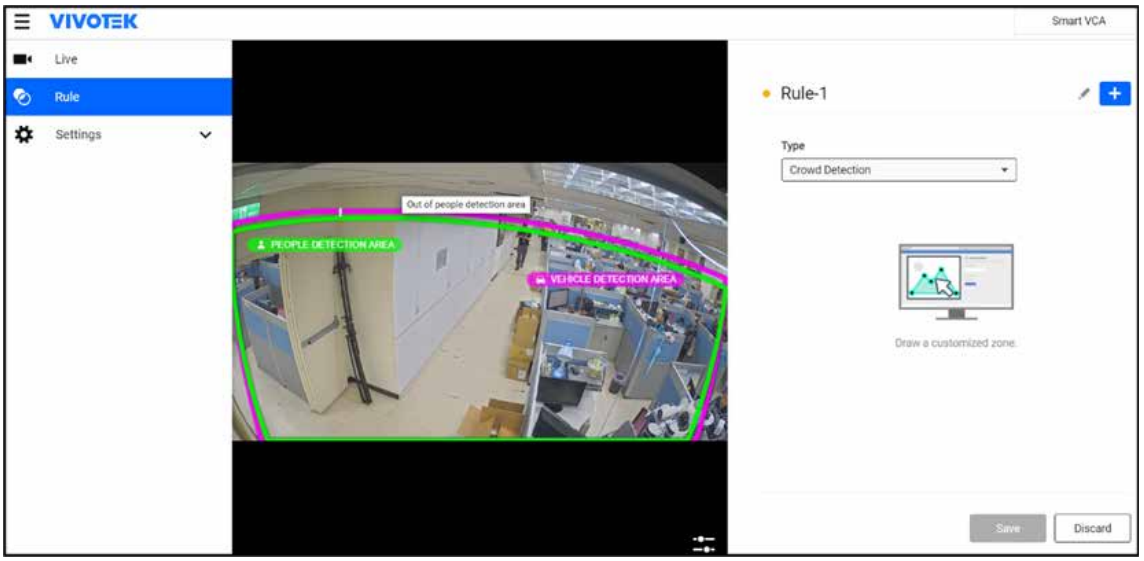
VIVOTEK VCA rule is composed by 4 major component.

1. Rule Type
2. Rule Definition
   Name Definition
   Monitoring Region Definition: Area / Line
3. Trigger
   Object: Define the types of object that can trigger the rule.
   External Trigger: enable the VCA rule by external control.
   Condition: Detail definition for limited triggering situation.
4. Action: Set the camera event triggered by this VCA rule
5. Schedule: defined the regular activated time by schedule setting .

Configuration the Smart VCA Rule

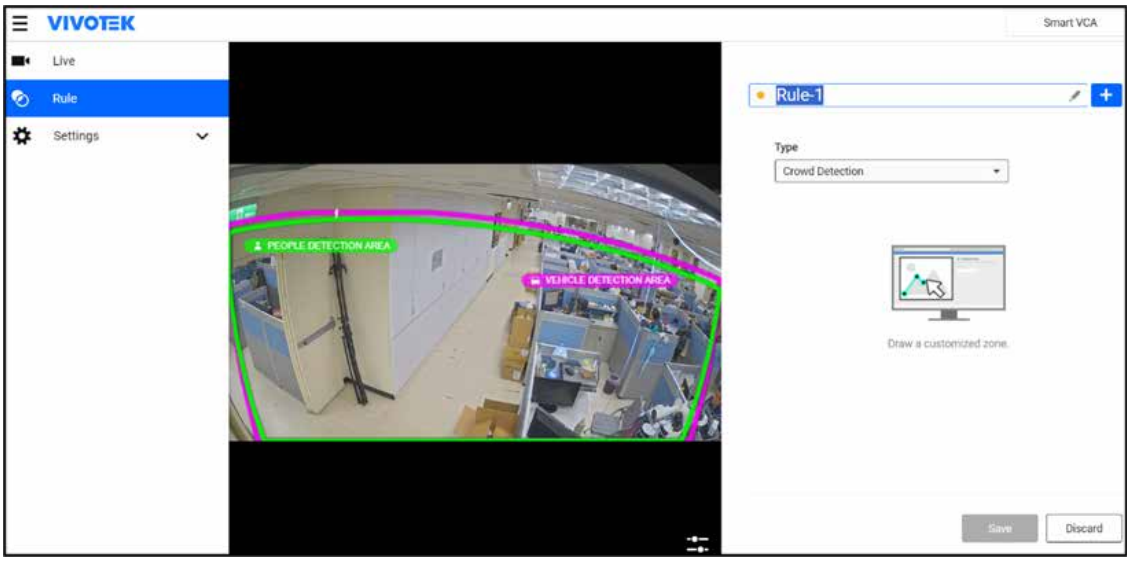
- **Add a new rule**

When configuring a detection rule for people detection, such as Intrusion, Loitering, or Line Crossing, we recommend adding rules within the detection area to enhance accuracy.



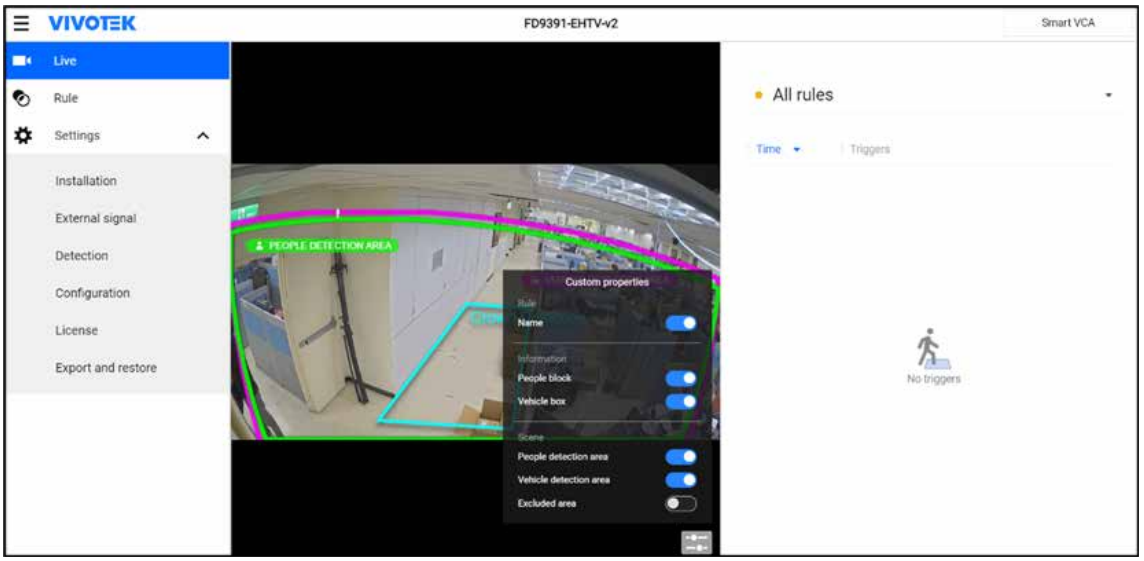
You can freely choose the rule name while creating it; however, please note that the name cannot be modified after the rule has been established.

Important:
For cyber security concern, following special characters are not allowed in the rule name: * $) (+ = , / | ? [; : \ ] < > “ ‘ & { }

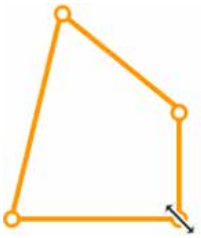


Click the Tools button at the lower-right of the streaming window for the display options. Users can toggle the Custom Properties option to show detailed information on the live page.

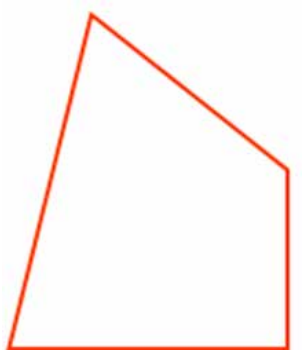
Configuration the Smart VCA Rule



Below are the statuses of the VCA rule detection polygons (zones):

Selected by a click. You can remove the window by the delete button.	When moused hover, you can edit the endpoints.	Click and drag the endpoints to edit the window coverage.
		

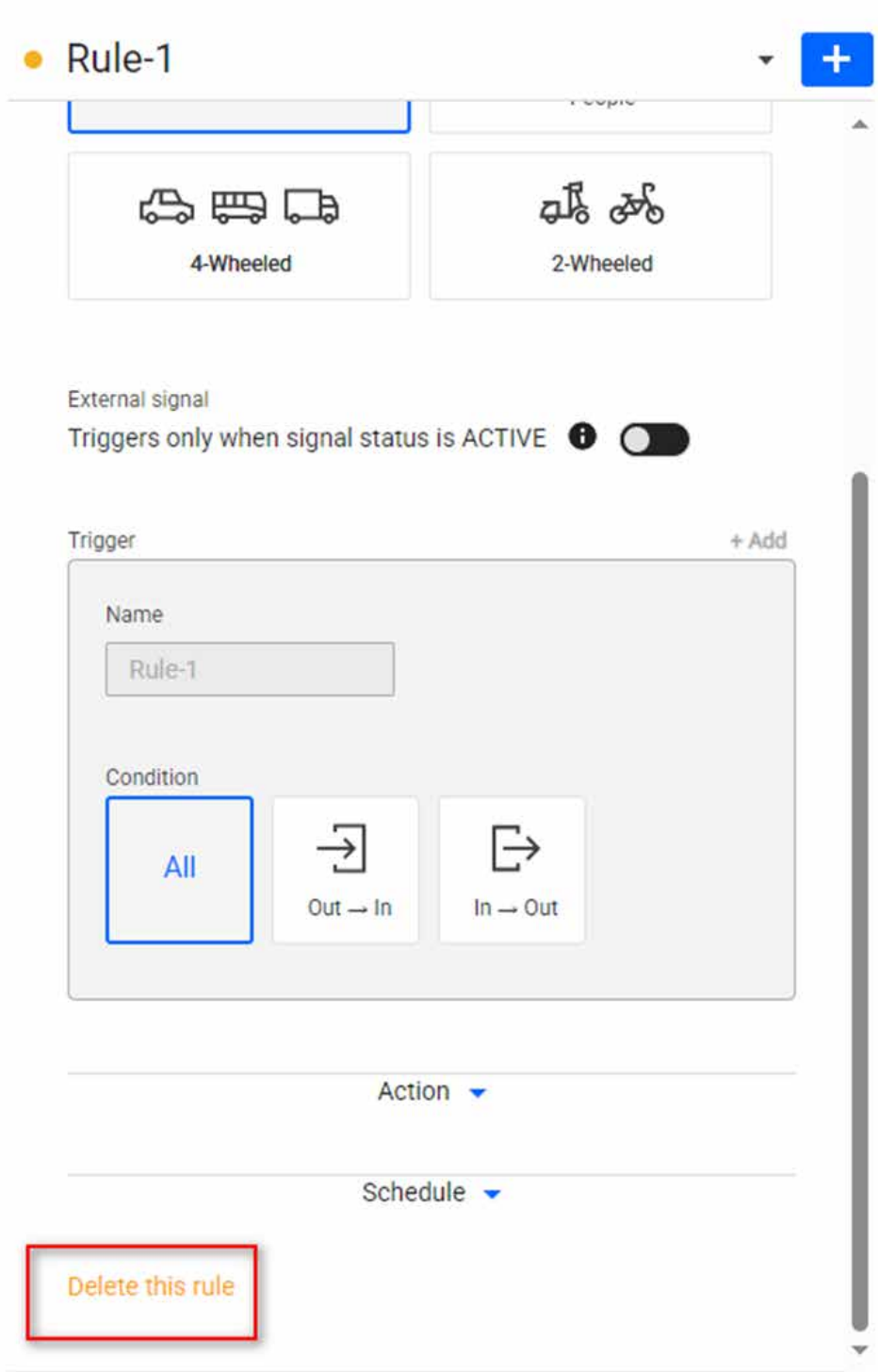
On the camera's live view outside the Smart VCA page, a red detection zone will show when it's triggered.



Configuration the Smart VCA Rule

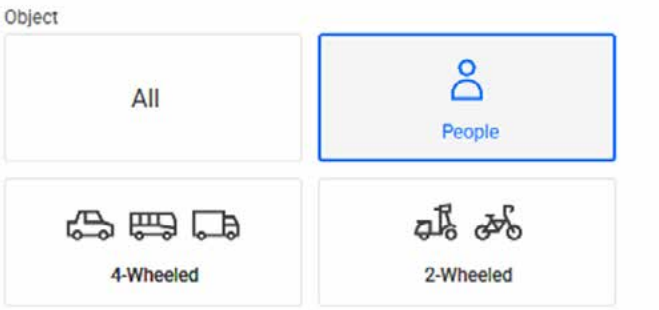
- **Delete a rule**

To delete a rule, please scroll down to click at the “Delete this rule” button.



Configuration the Smart VCA Rule

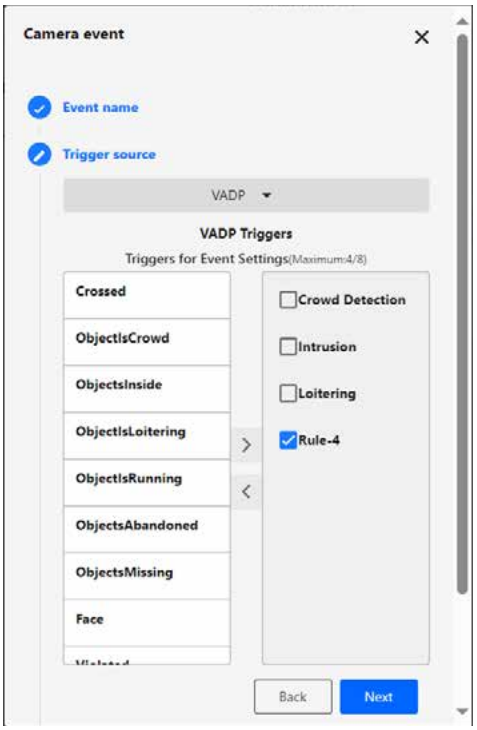
- **Object**



- **Action**

VCA is a powerful tool for detecting and analyzing objects within video footage. We recommend configuring events to receive notifications or trigger actions when a VCA rule is triggered. The camera can send notifications via Email, FTP, HTTP, or to networked storage, so be sure to click the “Go to Event Settings” button to set this up on the camera. If multiple cameras share the same notification, you can save time by adjusting the event settings on the NVR and VSS.

For more information about event settings, please refer to the camera user manual. Note that VCA rules use the VADP type as the trigger source.

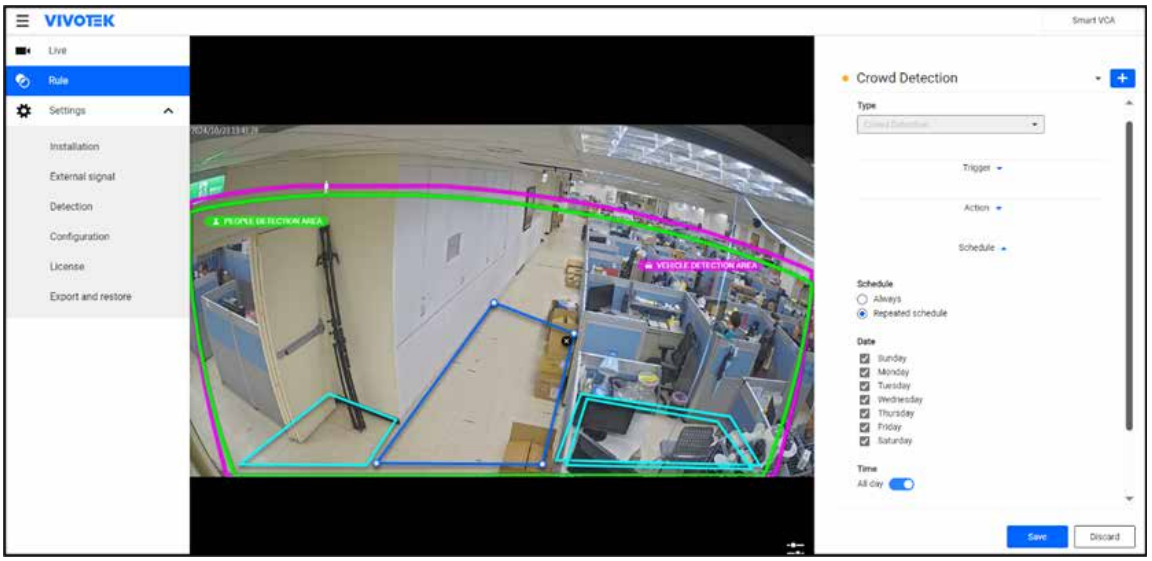


See **Coordinate events trigger by VCA** to know more details about events at the backend.

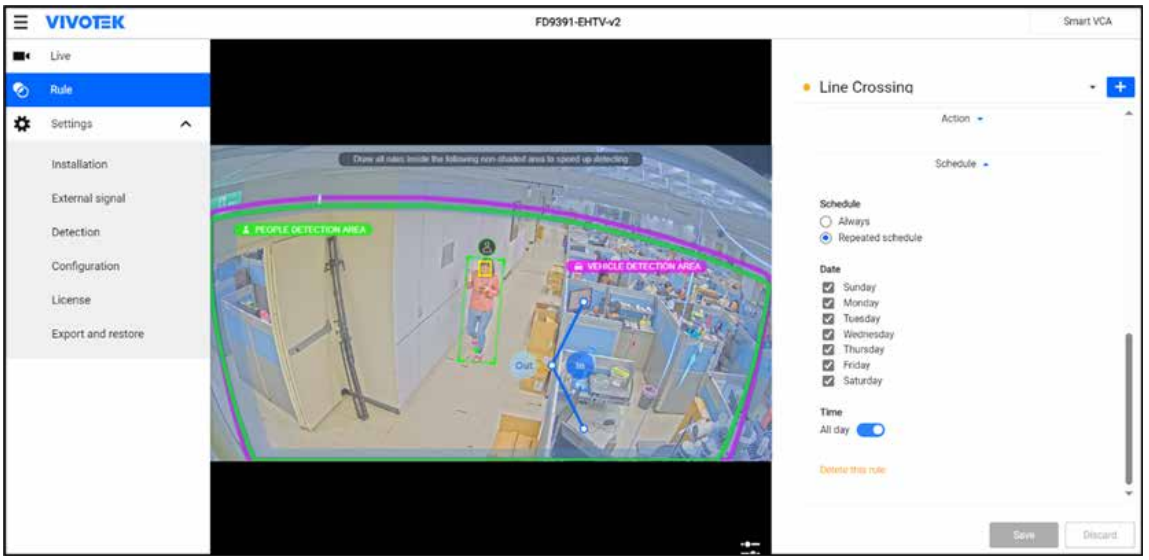
Configuration the Smart VCA Rule

- **Schedule**

Besides triggered by external signal, user can also define schedule for rule activation. For Smart VCA rules, the schedule settings can be found in the individual Rule configuration.

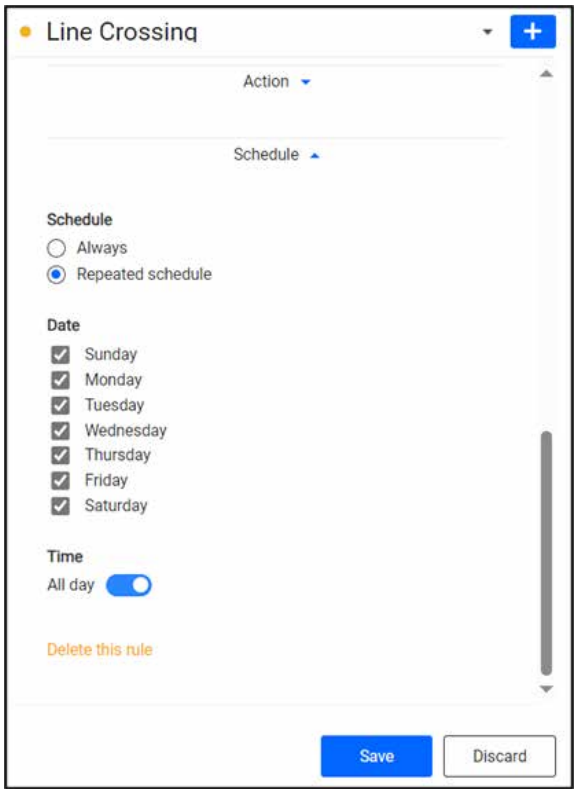


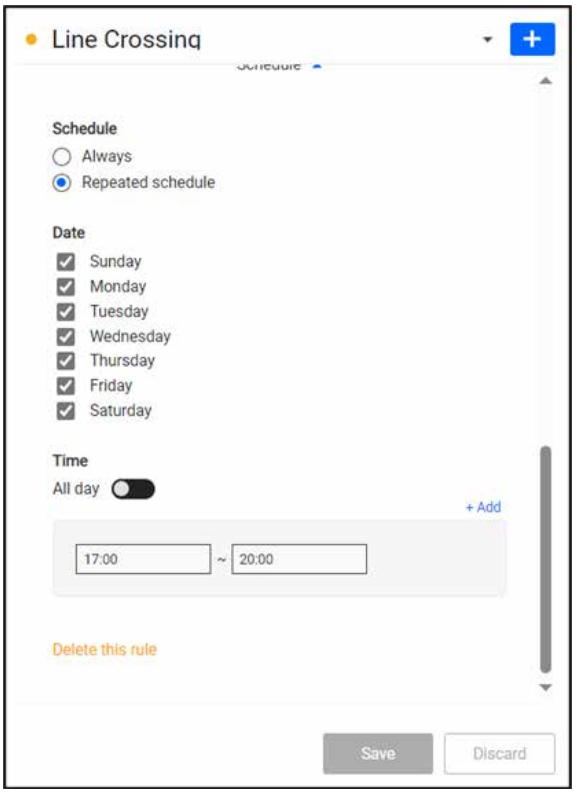
You can select the Repeated schedule check circle when configuring a VCA rule. The default is Always.



On the Repeated schedule setting, you can select the days for the rule to take effect within a week, and a period can also be defined as effective for a rule. Use the pull-down menus to select the beginning and the end time. The detection rule will take effect during these periods. Up to two-time spans can be configured for each rule. 1 or 2 time spans are available depending on the detection rule types.

Configuration the Smart VCA Rule





Due to the wide variety of view perspectives, zoom ratio, and the complex parameters involved, currently, there is no rule to calculate the speed of the object.

Another notice is that while people are moving around, the silhouette of one man can be blocked by another during their movements, and hence the detection can be interfered.

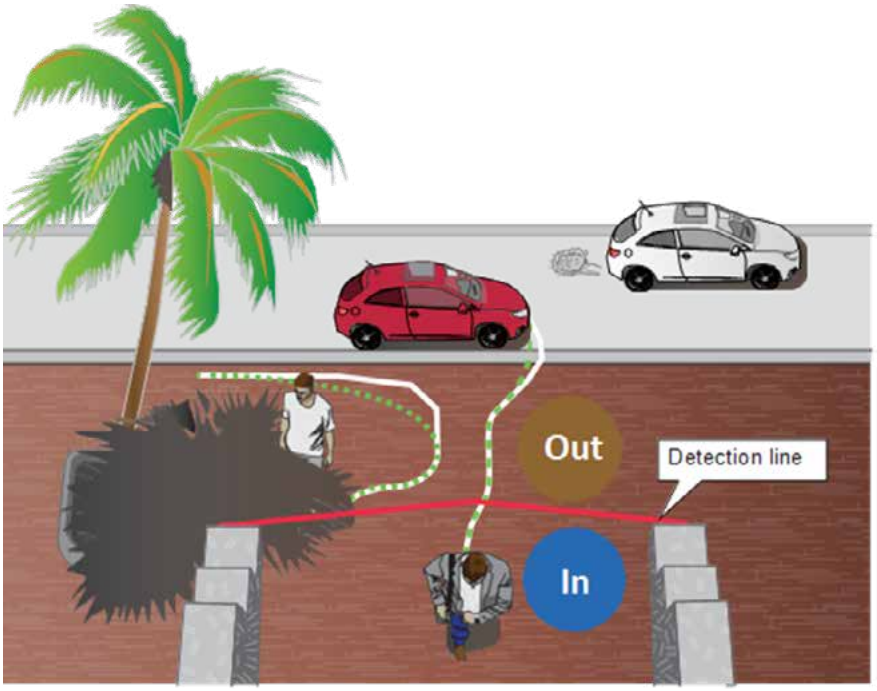
The indicators on the Speed level chart indicate the detected activities. They do not represent the number of people walking or running in the scene.

Configuration the Smart VCA Rule

Fundamental Functions

Line Crossing Detection

The Line Crossing detection detects one or multiple persons crossing a virtual trip-wire. The traffic direction can be assigned on screen for persons passing the line in one specific direction or in both directions.



The applicable scenarios of this feature can be:

* Detects someone who enters a drive way, entrance, or exit through the virtual line.

* Detects and triggers an alarm in a predetermined direction.

* The detection line can be used as a fence boundary to know if someone has crossed the articulated line around a perimeter.

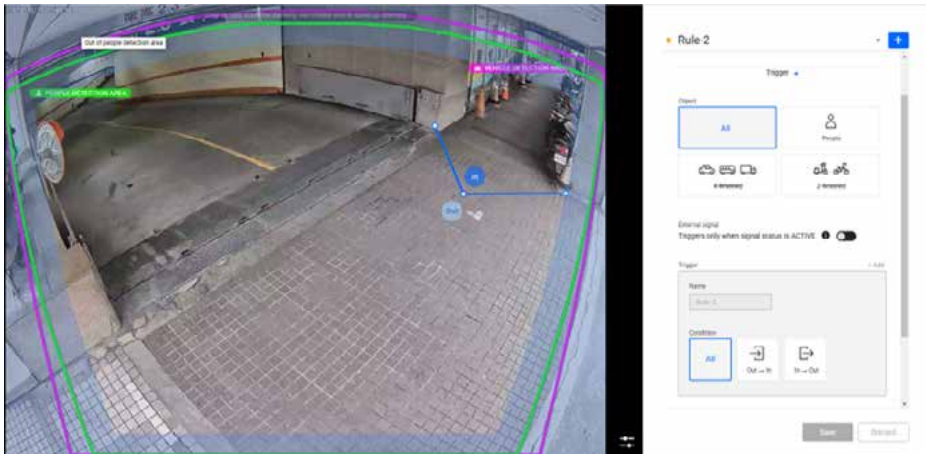
- **Line Crossing Rule Configuration**

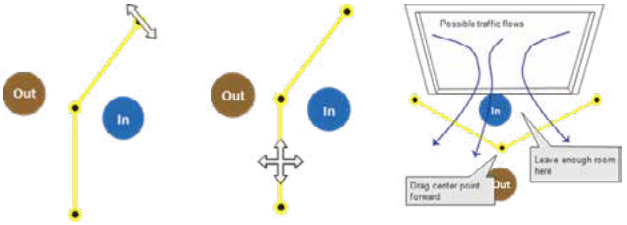
By default, a detection line will appear on the screen; use your cursor to change the location of the point and the rule. Select the direction of the line to suit your application.

Note that you should not place the line too close to the edge of FOV. The time people appear before reaching the line may be too short. The camera may be unable to detect people's presence before they cross the line. You can bend the line to make room for detecting the presence.

Configuration the Smart VCA Rule

Line Crossing Detection





Rule Line Definition

"Drag" and "Move" the key point of line to the path that you want to monitoring.

Note:

1. The line should slightly larger than the path width for covering whole possible traffic flow.
2. Make sure the line is in the"Non-shaded" area for securing the accuracy. If not, please check the camera setting and installation pose.

Configuration the Smart VCA Rule

Line Crossing Detection

Objects

User can select target object type as trigger

- All
- People
- 4-Wheeled
- 2-Wheeled

External Signal

Bound the rule with external signal source for rule activation trigger. Please refer Ch5-General Setting for detail.

Trigger - Condition

Depend on application and scene, user can define specific object's moving direction as abnormal that should trigger the event.

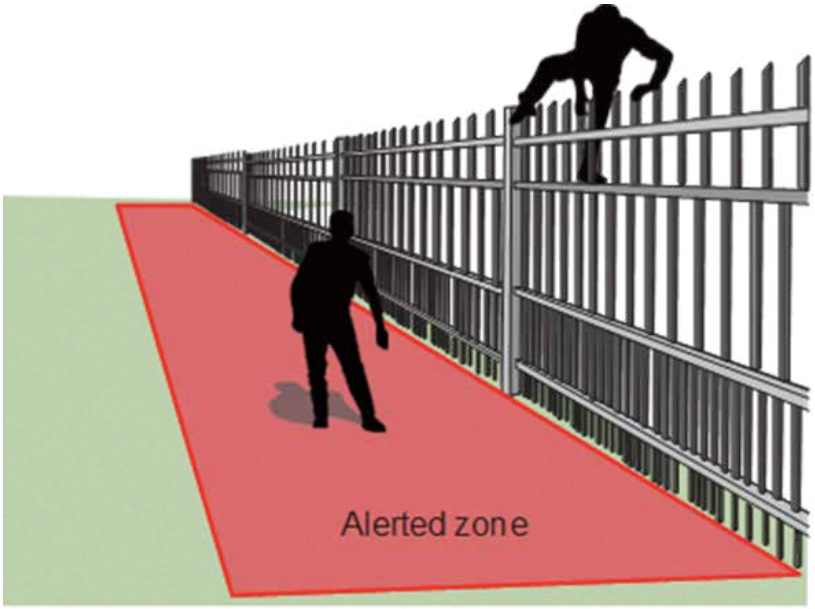
Schedule

Set "Always" or "Repeated Schedule" for rule activation.

Configuration the Smart VCA Rule

Intrusion Detection

VIVOTEK Intrusion Detection can be used to detect people entering or leaving a virtual area in the camera field of view.



Intrusion detection identify unauthorized entry or suspicious activity within a monitored area to detect and alert security personnel of potential threats.

Use Case

1. Monitoring the building vehicle entrance. Detect on whether people illegally walk in the vehicle entrance lane for safety protection.

2. Detects when a person enters a bank vault or school after the office hours.

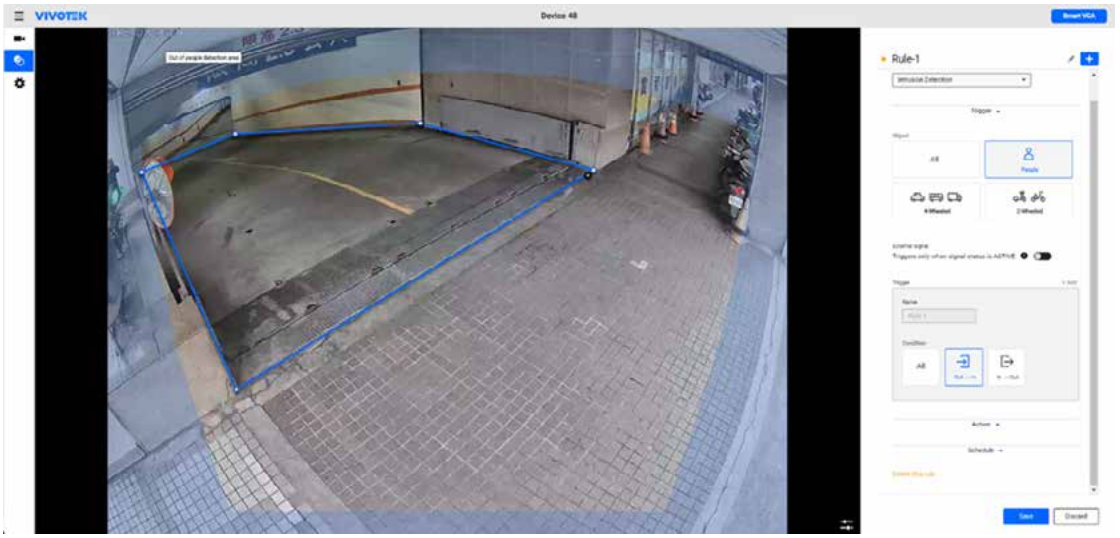
3. Detects when a person leaves an emergency exit or fire escape, or any place that is normally forbidden from access.

Benefit: Intrusion detection enhances security by providing real-time alerts, reducing the risk of theft or damage or unauthorized access. It enables quicker responses to potential threats, ensuring the safety of assets and people.

Configuration the Smart VCA Rule

- **Intrusion Detection Configuration**

Intrusion Zone Setting



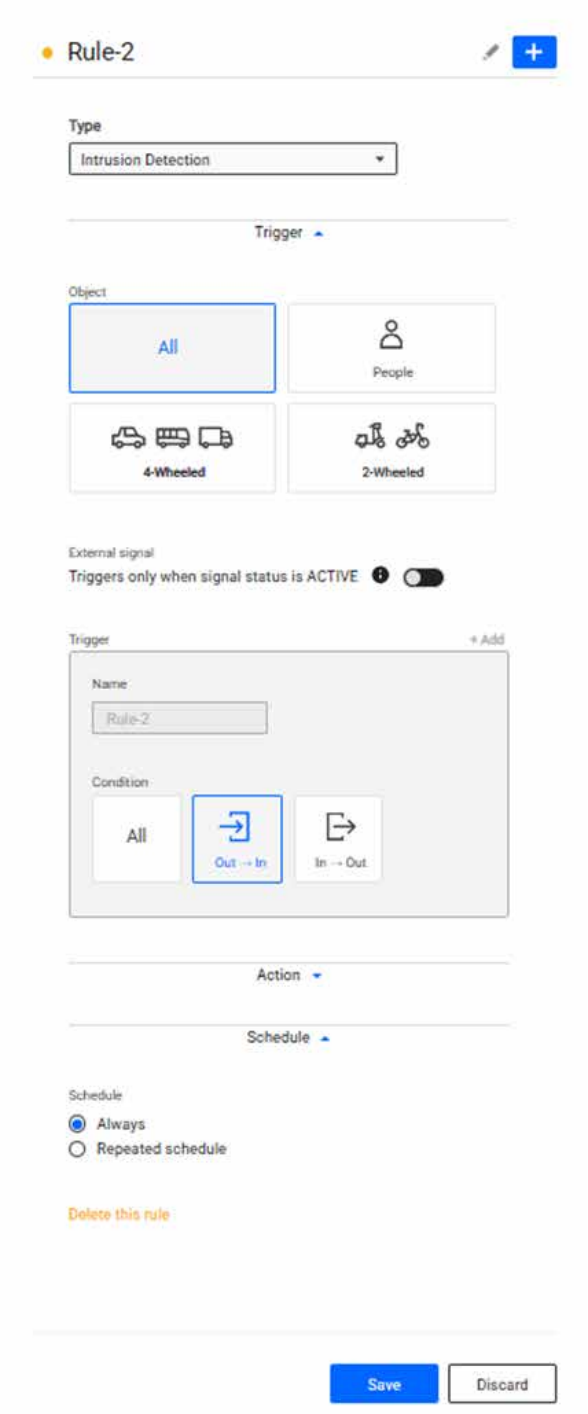
Area Definition

Click on positions on the live view screen to define the vertices of a polygon detection area, ensuring it forms a closed region.

Limitation

Please define the area within the “Non-shaded area” since there are sufficient space from the people/vehicle detection limitation.

Configuration the Smart VCA Rule



Objects

User can select target object type as trigger

- All
- People
- 4-Wheeled
- 2-Wheeled

External Signal

Bound the rule with external signal source for rule activation trigger. Please refer Ch5-General Setting for detail.

Trigger - Condition

Select the trigger Condition by object entering or leaving the detection area.

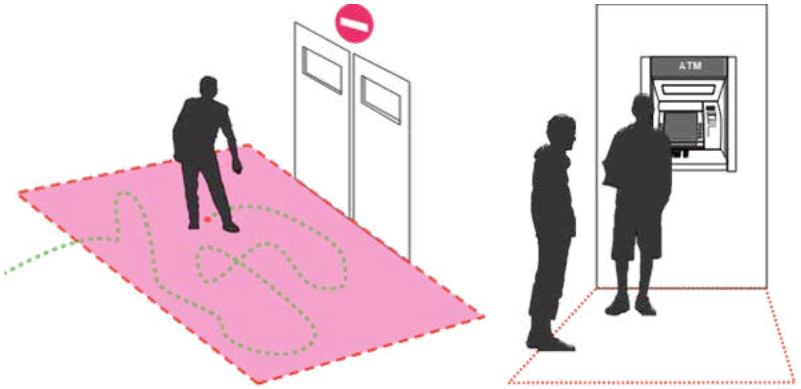
Schedule

Set “Always” or “Repeated Schedule” for rule activation.

Configuration the Smart VCA Rule

Loitering Detection

The Loitering detection can be used to detect a person or a group of people lingering in an area for longer than a preset time threshold.



The applicable scenarios of this feature can be:

- **Loitering Detection Configuration**

Loitering detection in surveillance involves monitoring areas to identify individuals lingering longer than a predetermined time, which may indicate suspicious behavior.

Use Case:

1. A transportation hub employs loitering detection to monitor platforms and waiting areas. If someone is detected loitering beyond normal limits, security is alerted to assess the situation.

2. Detects when a person is loitering at a walk-up of ATM lane.

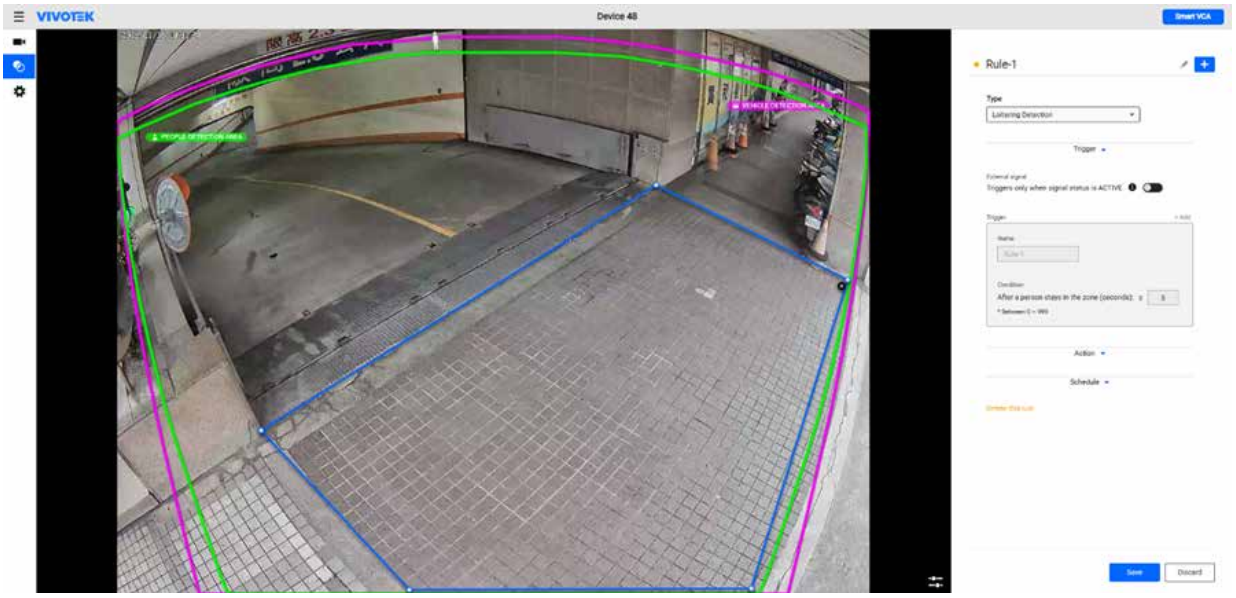
3. Detects when a person is loitering in a high-theft area of a store, or to prevent vandalism and break-ins.

4. Detects when a person is loitering in an area that is normally not an access for visitors.

Benefit: Loitering detection helps prevent potential security threats, such as vandalism or theft, by enabling early intervention. It enhances safety by allowing security personnel to focus on unusual behavior patterns, thereby improving overall situational awareness.

Configuration the Smart VCA Rule

Loitering Zone Setting



Area Definition

Click on positions on the live view screen to define the vertices of a polygon detection area, ensuring it forms a closed region.

Limitation

Please define the area within the “People / Vehicle Detection area” to secure reliable detection. If the region of interest is out of detection area, please review the camera setting or installation position.

Objects: Human Only

External Signal

Bound the rule with external signal source for rule activation trigger. Please refer Ch5-General Setting for detail.

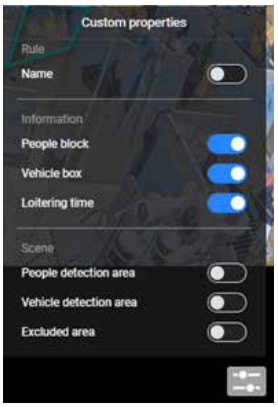
Trigger - Condition

Set “Time filter” for fine tune the sensitivity on event notification.

Schedule

Set “Always” or “Repeated Schedule” for rule activation.

Configuration the Smart VCA Rule

Loitering Time Display	
	After a person stays in the zone (seconds): Select a time threshold to trigger an event for a person lingering in the detection zone.  

Face Detection

Note:
Face Detection is a legacy Smart VCA rule that has been largely replaced by vision object analytics. Vision object analytics captures comprehensive data about a passing person, including a full-body bestshot, a close-up of the face bestshot, relevant attributes, and trajectory, all with a timestamp. The initial purpose of face detection, which was to reduce searching time, is no longer relevant. As a result, VIVOTEK will phase out the face detection rule in 2025 to simplify the user interface.

Face detection is not supported on fisheye cameras.

Currently there is no configurable option for this feature. Face detection detects the presence of human faces in the field of view. The recognition of facial features is determined by the built-in database.

Configuration the Smart VCA Rule

The applicable scenarios of this feature can be:

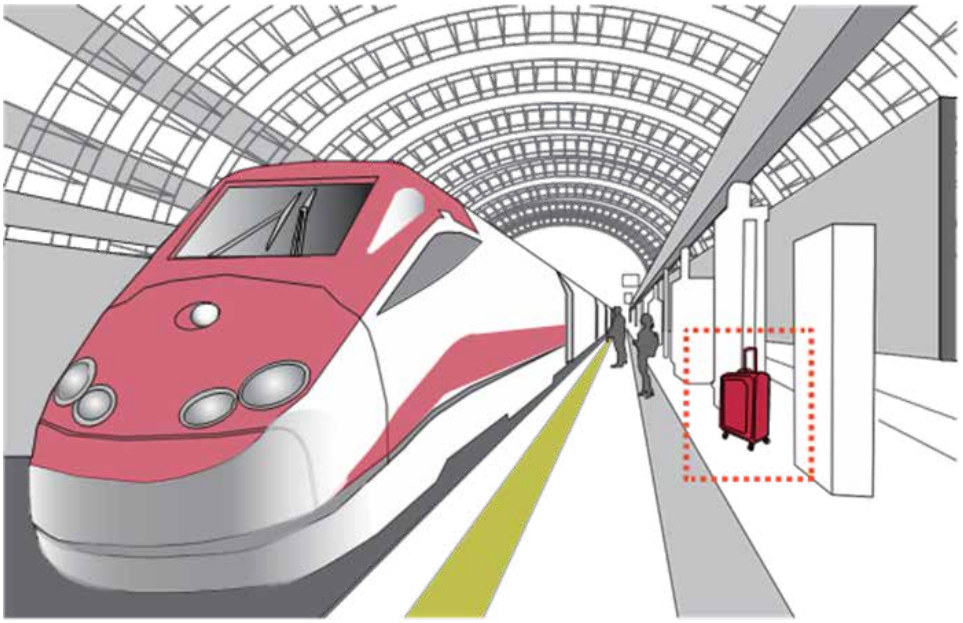
1. By tagging the video frames which contain facial features, the administrator can later search for the video clips with presence of these faces in a more efficient manner.

2. Instead of searching through hours of recordings, face detection can facilitate the process of forensic search in recorded videos. Objects irrelevant to facial features will be filtered out.

Smart VCA – Fundamental+

Unattended Object Detection

Unattended Object detection is to detect objects intentionally or unintentionally left on the scene.



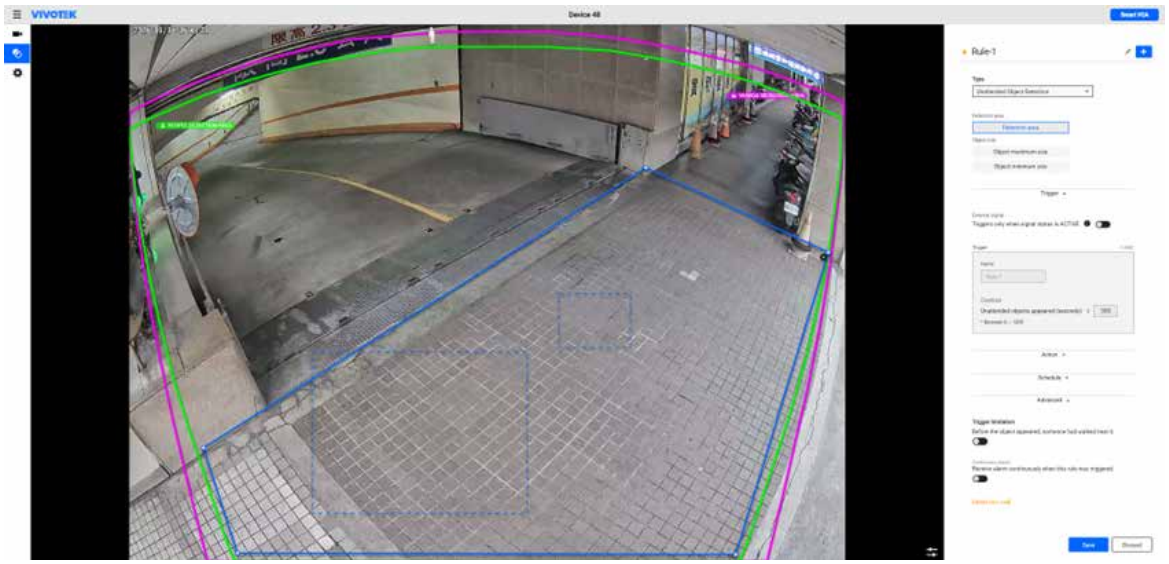
The applicable scenarios of this feature can be:

* Detects objects placed in front of an emergency exit.
* Detects objects left on subway tracks, platform, on a bridge, or in a bank lobby.

Configuration the Smart VCA Rule

- **Unattended Object Detection Configuration**

Loitering Zone Setting



Area Definition

Click on positions on the live view screen to define the vertices of a polygon detection area, ensuring it forms a closed region.

Limitation

For “Left object detection”, please define the area within the “People / Vehicle Detection area” to secure reliable detection on the human leaving the object. If the region of interest is out of detection area, please review the camera setting or installation position.

Maximum & Minimum Object Size

After the zone is set, two block will show in the live view windows.
User can drag their vertices to set the max and min size of object to detect

Configuration the Smart VCA Rule

External Signal

Bound the rule with external signal source for rule activation trigger. Please refer Ch5-General Setting for detail.

Trigger - Condition

Set “Time filter” for fine tune the sensitivity on event notification.

Schedule

Set “Always” or “Repeated Schedule” for rule activation.

Advanced

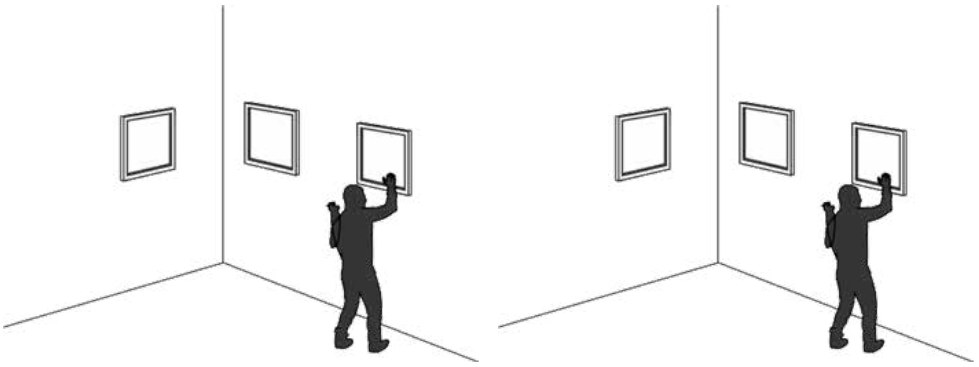
Bound with Human: For “Left object detection”, user can enable the 1st option. It will only notify the left-object event and ignore other like big trash bag blows around by wind.

Continuous Alarm: if you want it trigger the action like “indicator light” or “siren” by camera DO output continuously, please enable this option.

Configuration the Smart VCA Rule

Missing Object Detection

Missing Object detection is to detect the removal of a predefined asset from a surveillance scene.



The applicable scenarios of this feature can be:

* In a campus setting, the Missing Object feature can be used to monitor high-risk areas for theft, such as the administrative offices, computer labs, or science laboratories.

* Detects when theft occurs in storage areas or warehouses. It is helpful when there are security personnels monitoring the scene, yet their attention went down through time.

- **Missing Object Detection Configuration**

Missing Object Detection Setting

Configuration the Smart VCA Rule

Area Definition Click on positions on the live view screen to define the vertices of a polygon detection area around the object that you want to secure, ensuring it forms a closed region. **Limitation** For “theft detection”, please define the area within the “People / Vehicle Detection area” to secure reliable detection on the human leaving the object. If the region of interest is out of detection area, please review the camera setting or installation pose.	**Maximum & Minimum Object Size** After the zone is set, two block will show in the live view windows. User can drag their vertices to set the max and min size of object to detect Make sure the “object of interest” is within the range.

Configuration the Smart VCA Rule

External Signal

Bound the rule with external signal source for rule activation trigger. Please refer Ch5-General Setting for detail.

Trigger - Condition

Set “Time filter” for fine tune the sensitivity on event notification.

Schedule

Set “Always” or “Repeated Schedule” for rule activation.

Advanced

Bound with Human: For “Left object detection”, user can enable the 1st option. It will only notify the left-object event and ignore other like big trash bag blows around by wind.

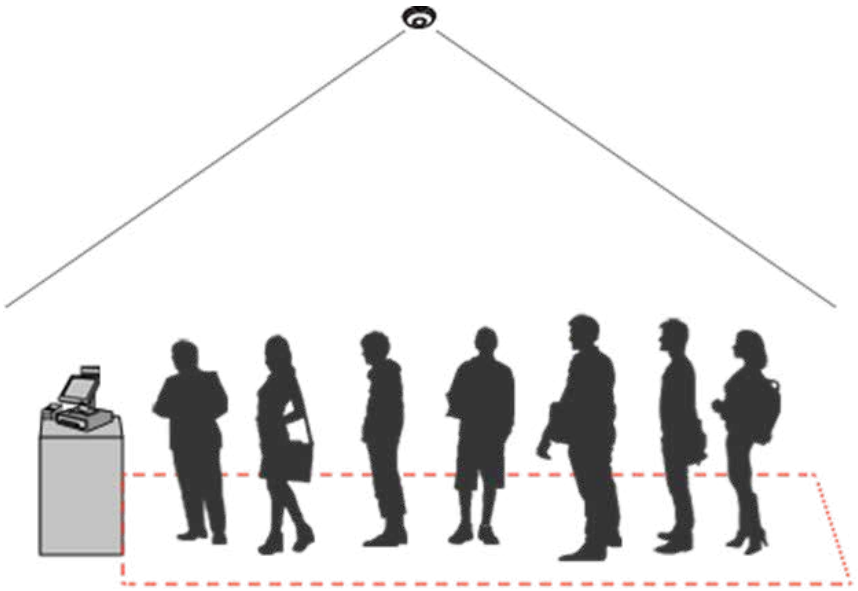
Note:

The missing object detection algorithm rapidly learns the presence of objects in a scene within only a few frames. Therefore, if objects are continuously moved in and moved out of the scene, the events will be triggered whenever objects are moved.

Configuration the Smart VCA Rule

Crowd Detection

For important access or checkout areas, the crowd detection can be used to trigger an alarm when the number of people waiting has exceeded a configured threshold. The number of people waiting in queue reminds a manager of staff management problems and to take immediate actions, e.g., sending men to help or opening another check-in counter.



The applicable scenarios of this feature can be:

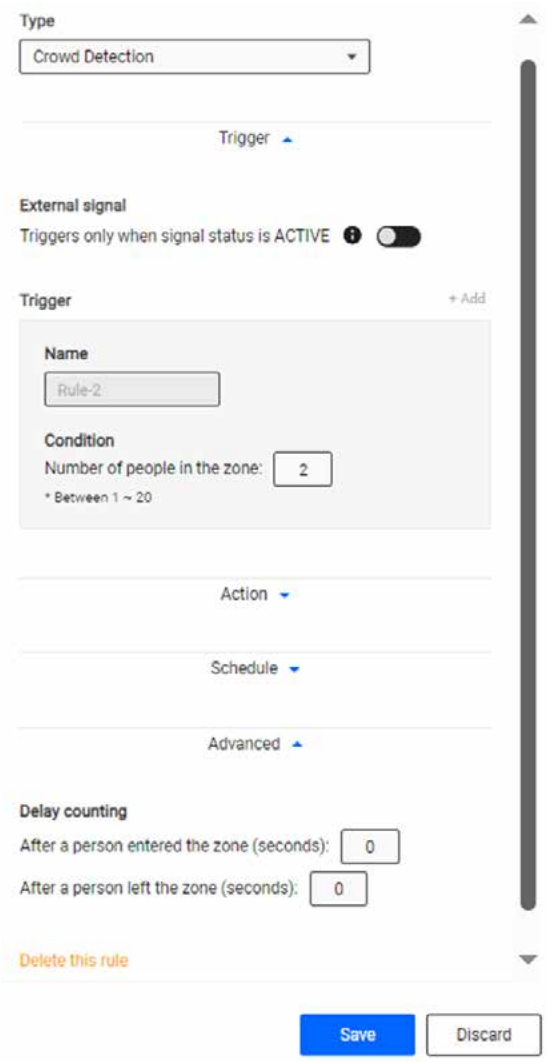
* Detects abnormal gatherings within sensitive areas.

* Monitors the utilization rate of services or facilities.

* Can help improve the efficiency of customer service and improve customer experience. It leads to better planning and more cost-effective staffing.

Configuration the Smart VCA Rule

- **Crowd Detection Configuration**



Select to detect when the number of people exceeds a pre-configured threshold.

The number of people in zone ≥: If the number of people equals or exceeds the threshold number, an event will be triggered.
The max. number is 20.

After a person entered the zone (seconds): People must be present in the zone for _ seconds before the detection takes place. When staying for a time too short, people may not have the intention for staying or entering.

After a person left the zone (seconds): An effective count takes effect after people left the zone for _ seconds. If a man leaves a zone temporarily for 1 or 2 seconds, he may not intend to leave. If a crowd of people are talking and standing close together, one man may block the image of another. The person may be temporarily undetected.

If someone stands very still playing his cell phone, he may be exempted from track list. Setting the leave delay for 1 or 2 seconds helps correct this issue.

Configuration the Smart VCA Rule

Proactive Safety Functions

Parking Violation

The Parking Violation detection helps when vehicles stay still for a period of time in an area. You can configure an area where parking can cause problems. You can configure an event notification when vehicles stay longer than a configurable period of time, e.g., 20 seconds.

The applicable scenarios of this feature can be:

* Detects abnormal parking on the side of the road.
* To receive notifications when someone parks in front of an important access.

- **Parking Violation Configuration**

Click on the screen to draw a non-parking zone.

After a vehicle stays in the zone: (seconds) ≥ xxx seconds. Enter a number to be the duration of time for a vehicle to stay before triggering an event.

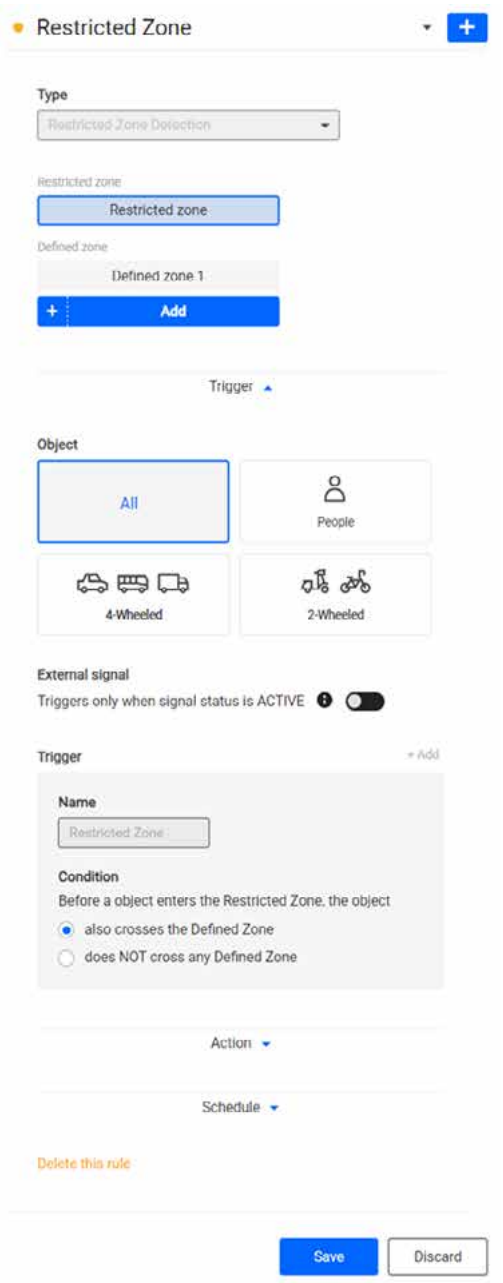
Configuration the Smart VCA Rule

Restricted Zone

The Restricted Zone is a conditional detection where an intruder can be detected by entering a Restricted zone. The workers inside a facility will not trigger an alarm by entering a Defined zone first and then enter the Restricted zone.

The applicable scenarios of this feature can be:
* Detects and triggers an alarm when a person or vehicle enters a restricted zone while someone passes through two zones will not trigger an alarm.

- **Restricted Zone Configuration**



Restricted zone: Click on the screen to draw a restricted zone.

Defined zone: Use clicks on the screen to draw one or two defined zones.

Before an object enters the Restricted Zone, the object also crosses the Defined Zone: This determines the direction in which the event will be triggered. The object must pass the Defined zone and then enter the Restricted Zone to trigger an Event.

Before an object enters the Restricted Zone, the object does NOT cross any Defined Zone: This option is the contrary. An object enters the Restricted zone will trigger an alarm, while the alarm won't be triggered if the object enters the defined zone first.

Configuration the Smart VCA Rule

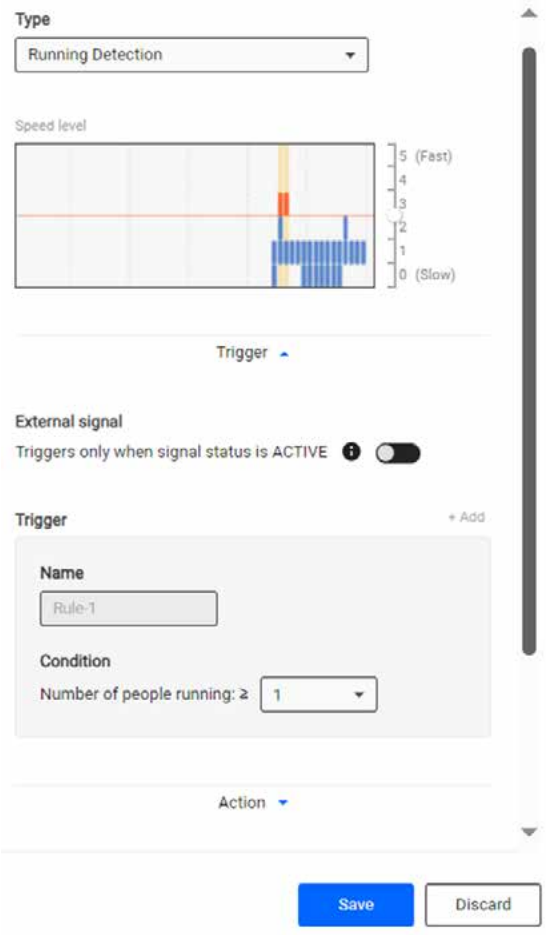
Running Detection

Running Detection can be used to detect people running from a crime scene or rioting occurs in a virtual area, such as gang fights. The algorithm can detect abnormal running behavior with a speed higher than the normal walking speed.

The applicable scenarios of this feature can be:

* Detects when a person running from a crime scene.
* Detects unusual events when one or many people running in abnormal speed such as on a plaza, shopping mall, etc., that is normally calm with casual activities.

Running Detection Configuration



Number of people running ≥: Select a number to trigger an event (normally 1) when people run in the scene.

Speed level (0 ~ 5):

Red: People moving faster than the threshold. Considered as running.

Blue: People moving slower than the threshold. Not running.

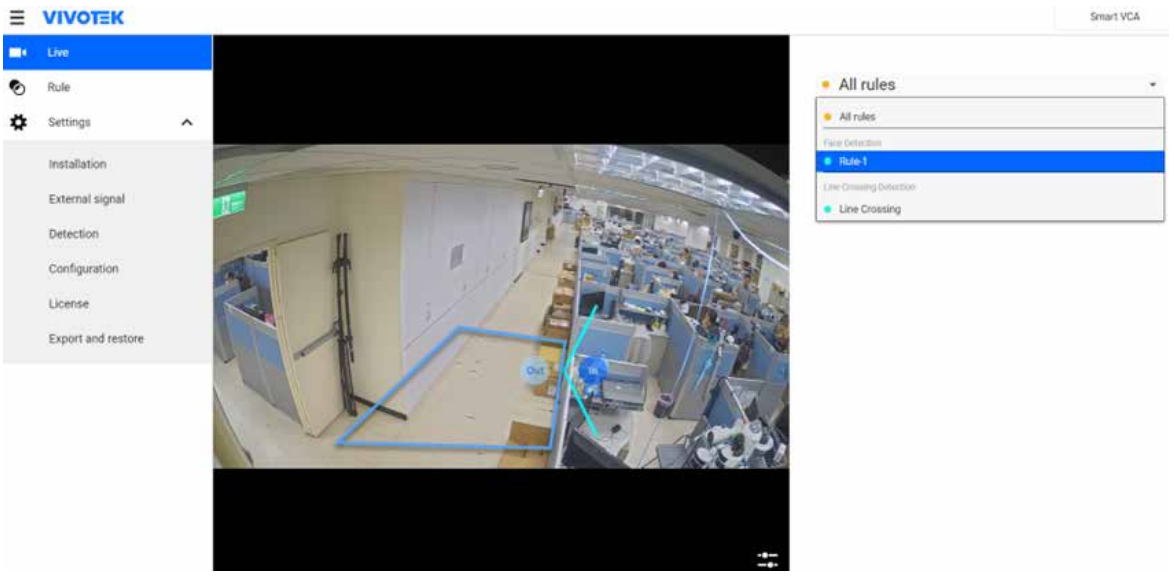
Threshold tab: Pull this tab to determine the threshold for moving speed.

The speed parameters are determined by the size of your FOV. In a wide open scene where people are smaller, you can tune the speed threshold lower. In a near scene where people appear larger, you can tune the speed threshold higher.

It is recommended to have a co-worker to run in the scene when you are configuring the speed threshold. Try test the effectiveness by observing the human traffic in scene. Observe and use the speed threshold tab to change the threshold. A speed faster than level 5 will still be displayed as level 5; 0 means static.

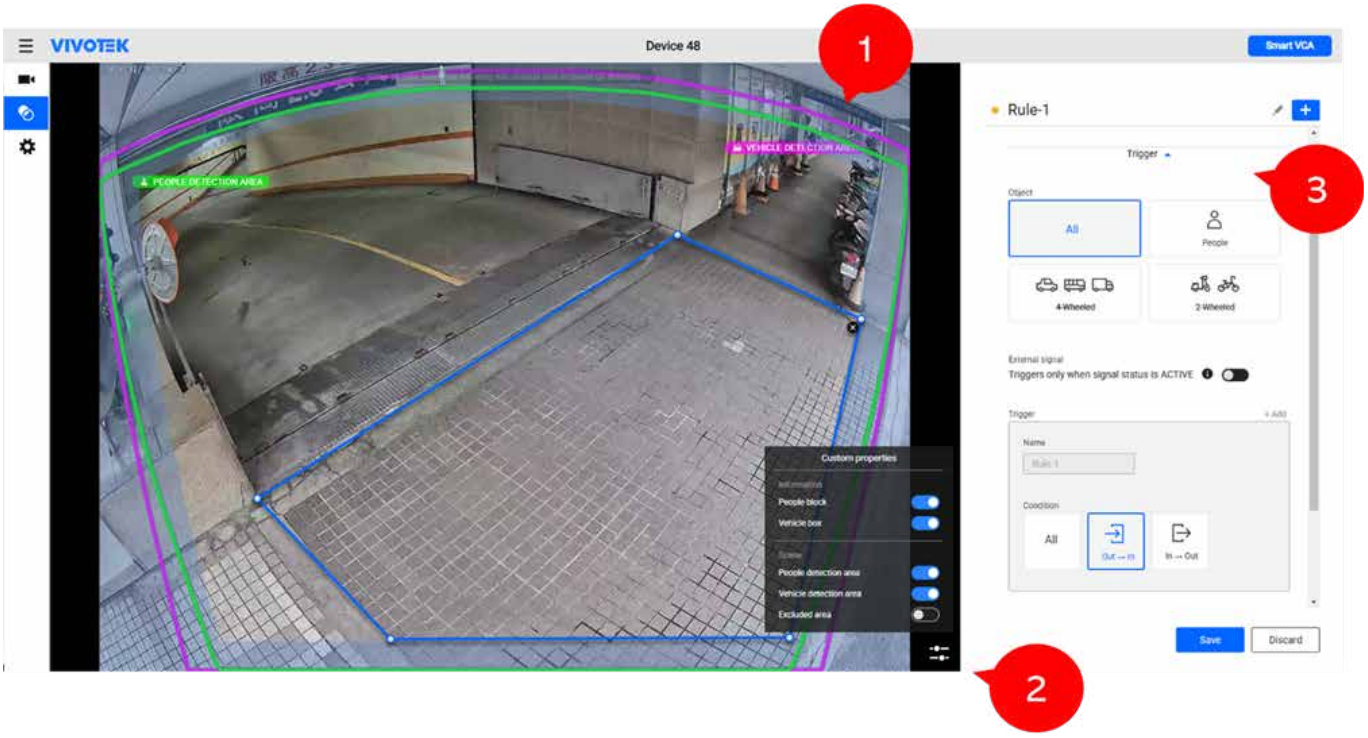
Configuration the Smart VCA Rule

Use the Add rule button + to configure a new rule. This button will be disabled if all 5 rules have been created. If there are existing rules, they can be found in the pull-down menu. You may also click the specific detection zone on the screen. A selected zone (rule) will have its border points highlighted.



Select from the pull-down menu the type of VCA detection features you want to configure. Click on the streaming window to create a detection zone in which you want the detection feature to take effect. You can use up to 20 clicks to generate border points.

Configuration the Smart VCA Rule



1. Live View Windows

Shows the live streaming. User can use the “custom properties” to choose what information are display on the windows.

2. Custom Properties

Toggle the display of information on the screen.

- Scene:
Detection & Exclusion Area

- Object Tracking Box

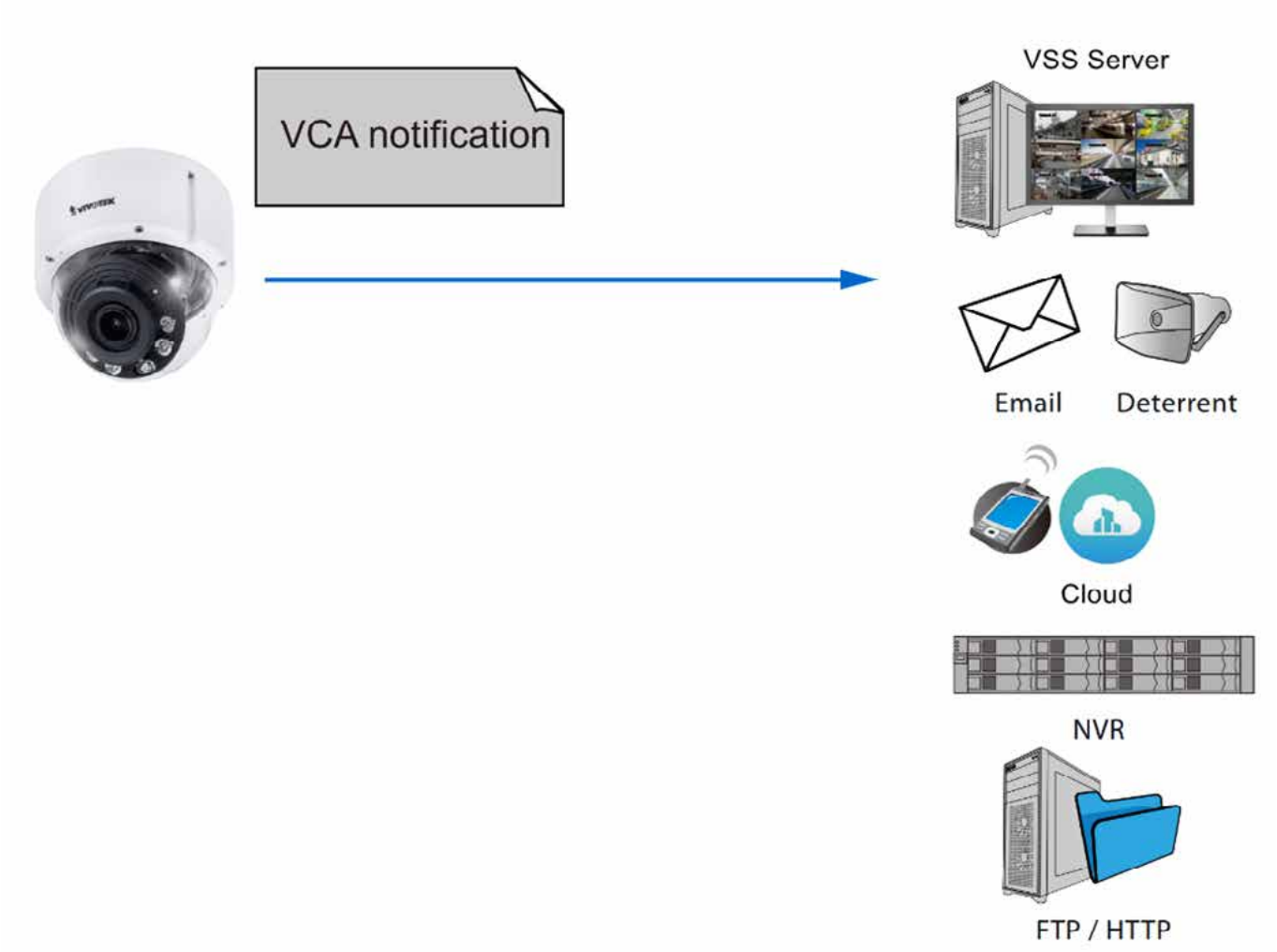
3. Rule Setting Area

Detail setting on

- Choose rule
- Rule Naming
- Object type to monitor
- Specific trigger condition
- Action Definition
- Schedule

Coordinate events trigger by VCA

When the Smart VCA configuration is made, associate the event delivery with the occurrence of VCA events. For example, you can configure the camera to record the related video clips by the time the events occur or send an Email containing a snapshot of the event.

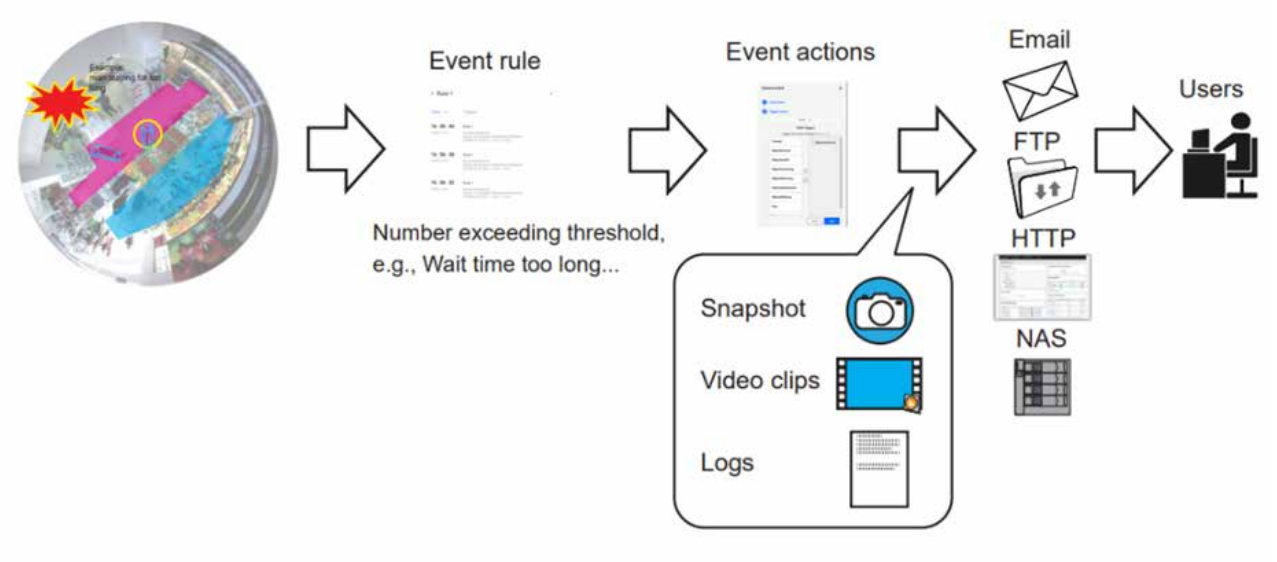


Coordinate events trigger by VCA

Camera event

Configure the camera event notification in camera Configuration > Event. With the event, the camera can send your receivers snapshots, video clips, or logs.

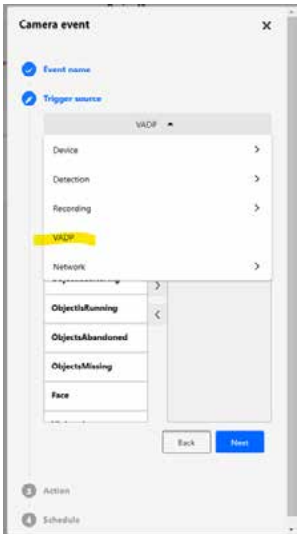
Set the **Event server & media** before configuring the event. For more details about the server & media, please refer to the camera user's manual.

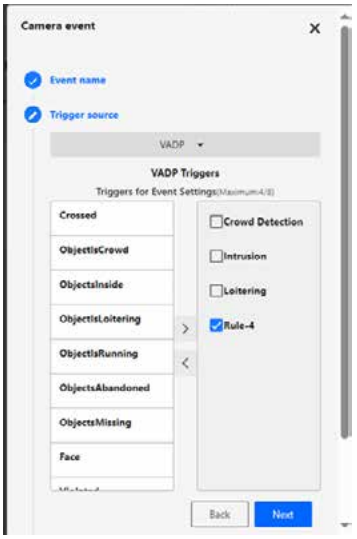


Coordinate events trigger by VCA

In camera event, VCA rules can be select as a VADP trigger source.

Add Event





1. For trigger source, choose “VADP” category.
2. Select the VCA rule predefined.

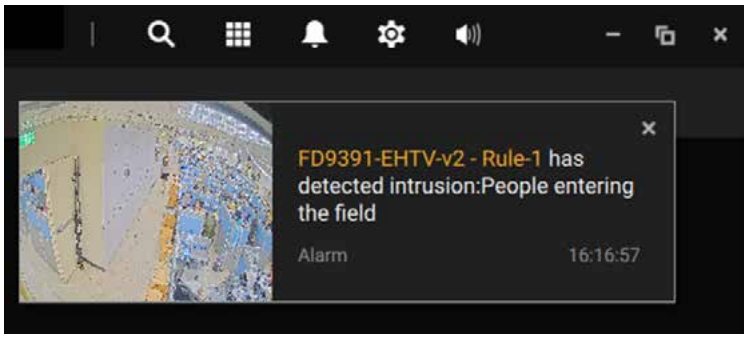
Coordinate events trigger by VCA

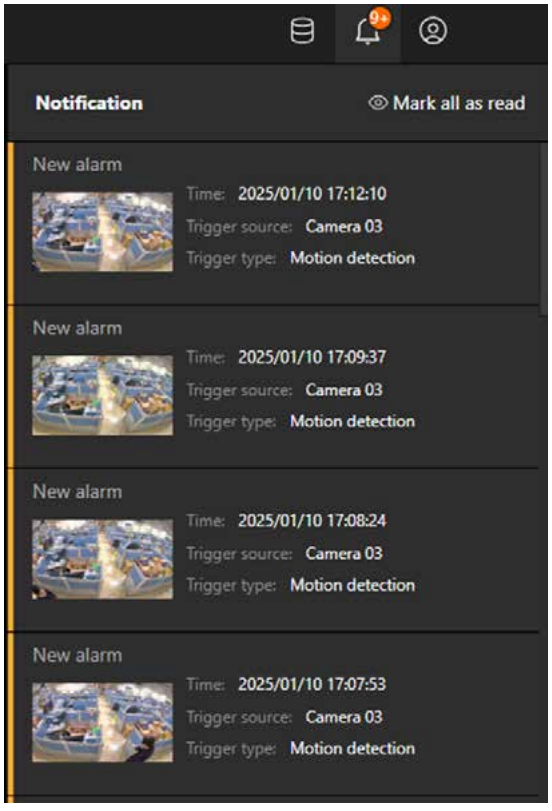
VCA Event on the VIVOTEK Backend System

When cameras are added to VIVOTEK backend like VSS and ND-NVR, it will be convenient to manage several cameras with VSS/NVR and users can see the event of all VCA rules of different cameras on one VSS/NVR. On VSS/NVR, the user can configure it to have an alarm pop up to get a warning when a VCA rule is triggered, or configure and search in the recorded footage to obtain evidence.

Real-time alarm by VCA event

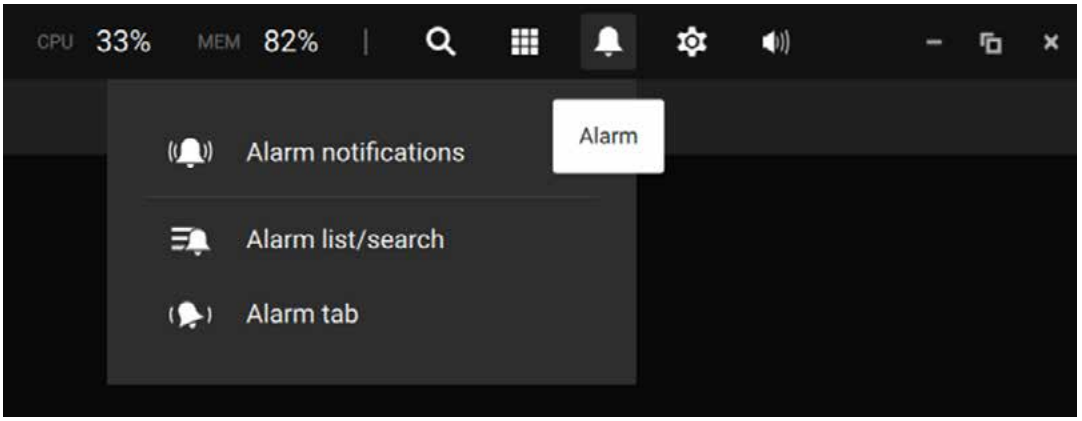
When configured with backend, VCA events can be prompted on the live view as an alarm and be searched. A single click on the event prompt can replay the related video footage.



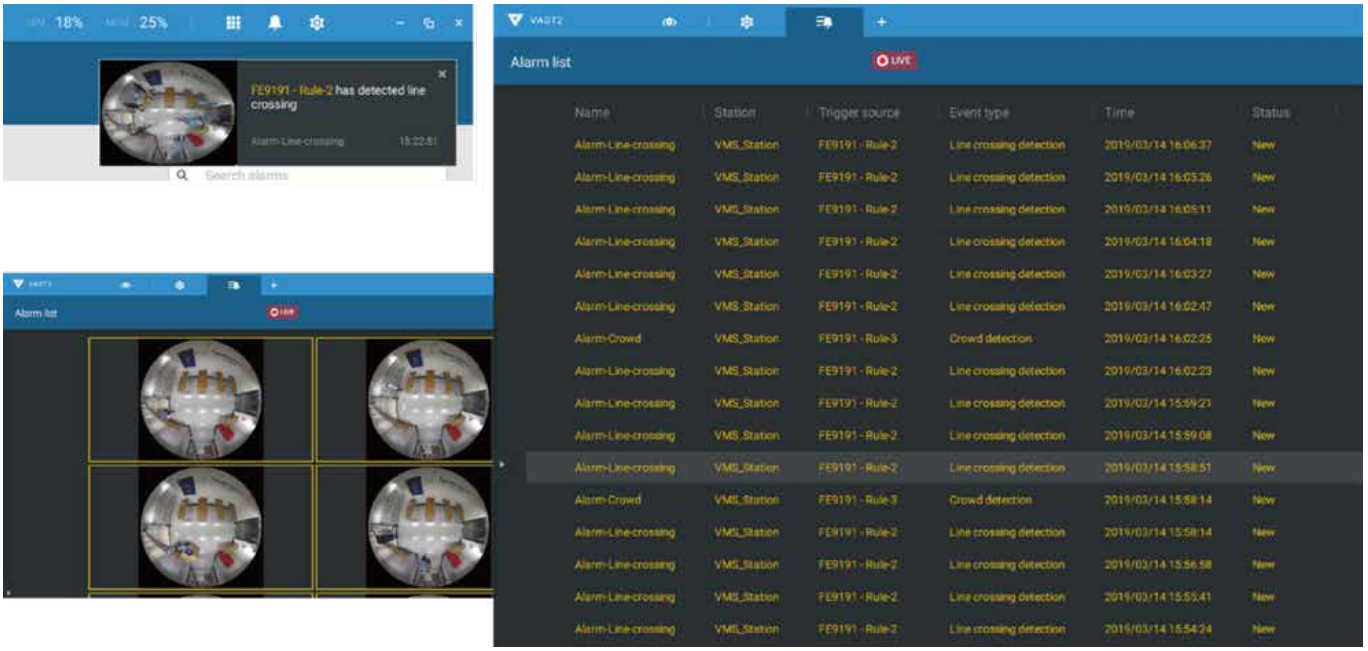


Coordinate events trigger by VCA

All alarms can also be searched in the Alarm list/search; refer to 2-13 Alarm in VSS user manual to know how to configure the alarm and search it in the list.



VCA Events as Event Prompts, in List, and in Thumbnails.



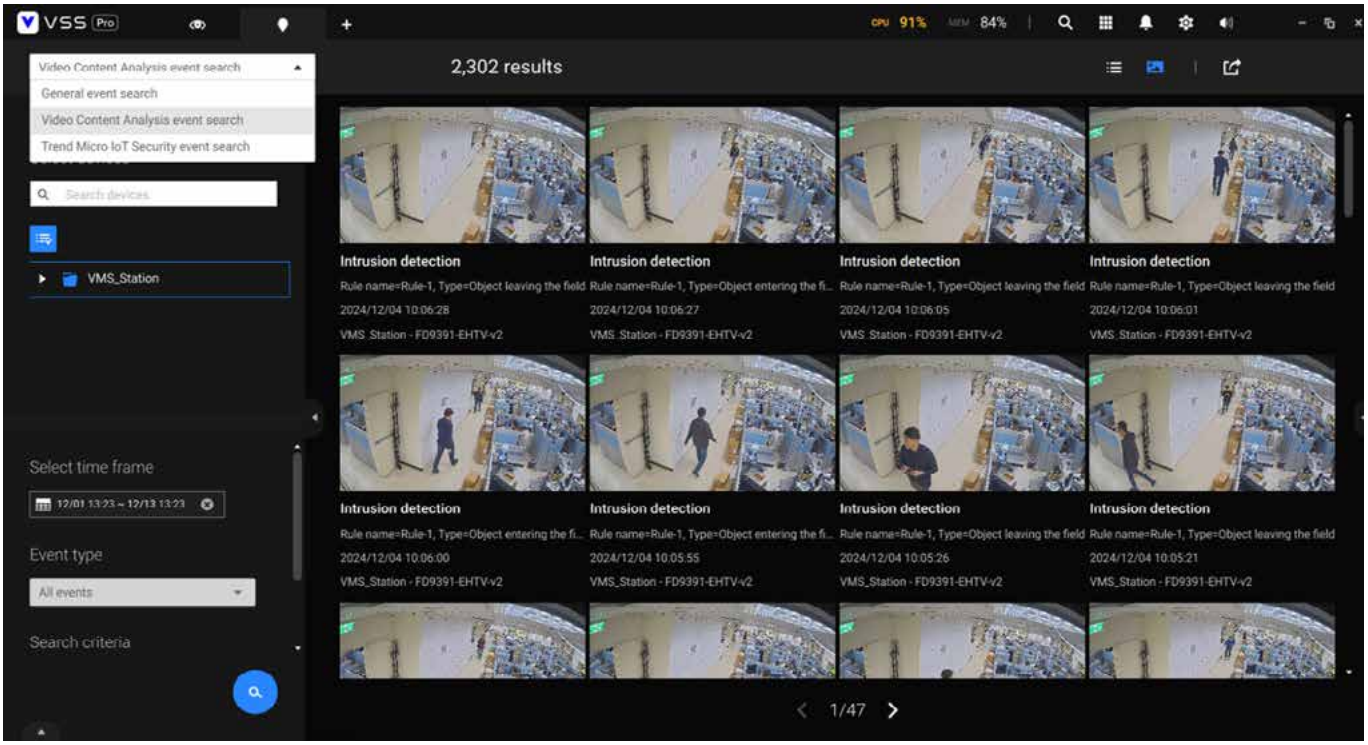
For VCA events such as a wait line that is too long at the checkout, a trespasser crossing the fence, the security staff can quickly take a look.

Smart VCA also supports the traditional event messaging, such as Sending live streams, record videos, send HTTP requests, send videos to FTP, sending Emails with snapshots, etc.

Coordinate events trigger by VCA

Event Post Search

When a camera is added to VSS & NVR, the camera will send all VCA events and detected objects to backend with zero configuration, the user can have a glimpse at the events of all cameras and search in the recorded footage at any time. VCA events are tagged and can be retrieved from the event list/search. Note that the VCA rules must have been configured on each camera before the event search can occur.

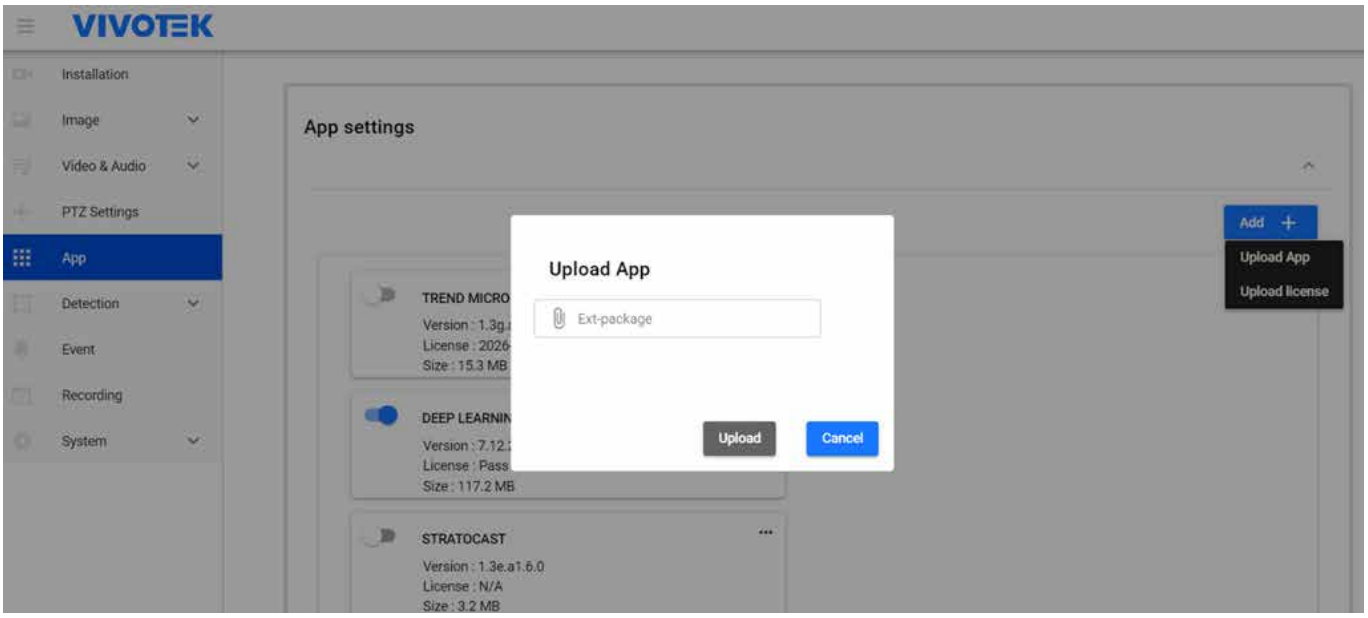


Uploading Specific Deep learning VCA Package

You can download the VCA package from VIVOTEK's website or acquire it through your distributors or sales. The download link of the Smart VCA package of your camera is on the Download section on the camera official website. Remember to unzip the file to get the VCA-xxxx.tar.gz file. There are two ways to upload the VCA package to the camera.

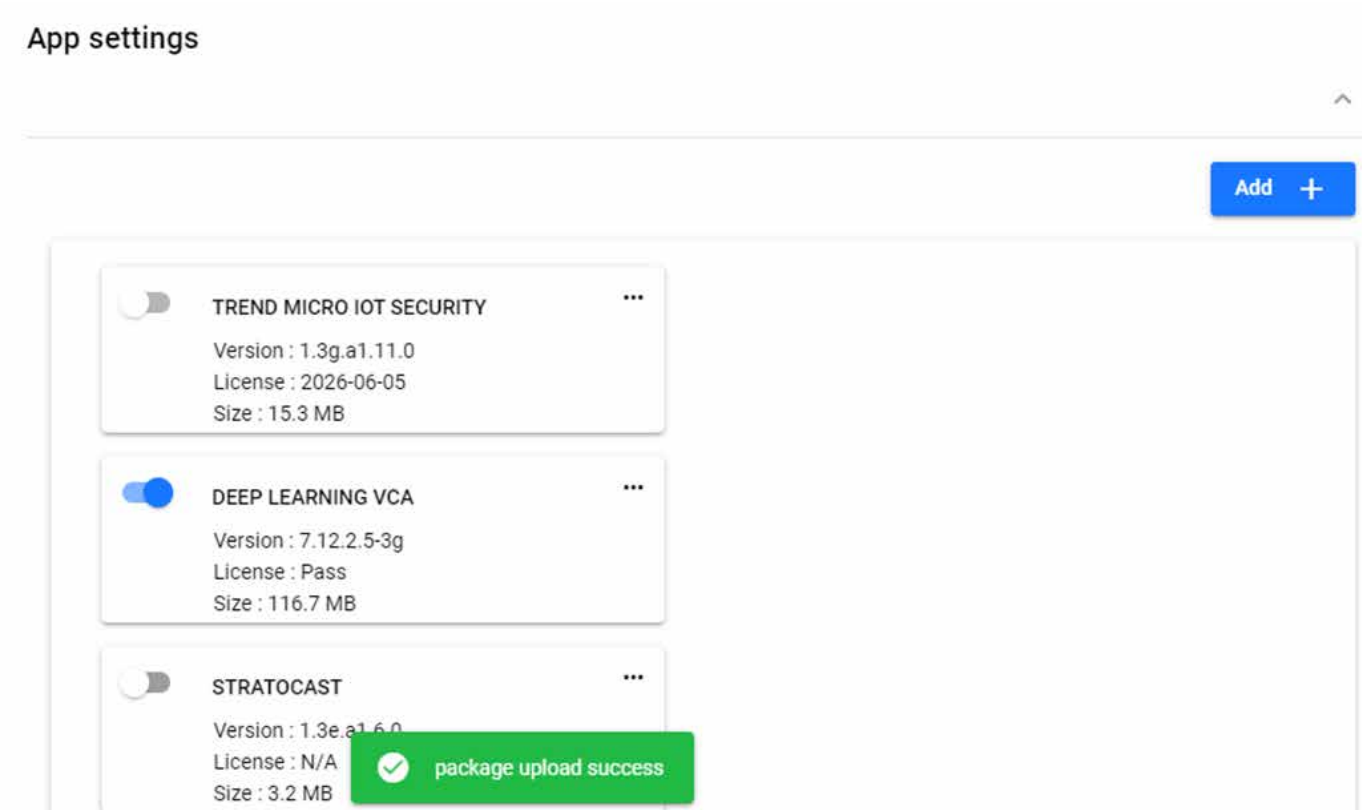
Uploading the package to one camera

1. On the camera web console, go to App> Add> Upload App> Ext-package to locate the VCA package, then click upload. The upload window will keep on the screen when uploading.

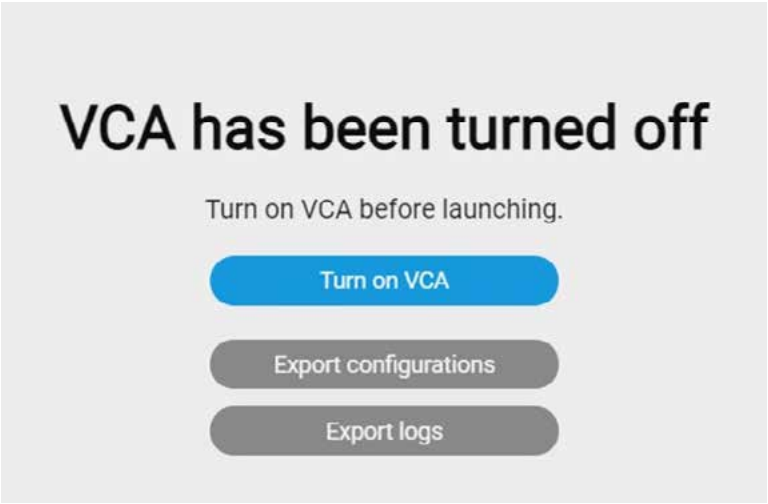


Uploading Specific Deep learning VCA Package

2. A green message box will appear after the package has been uploaded successfully.



3. You can export your configurations and system logs for debugging purposes without running the VCA package.



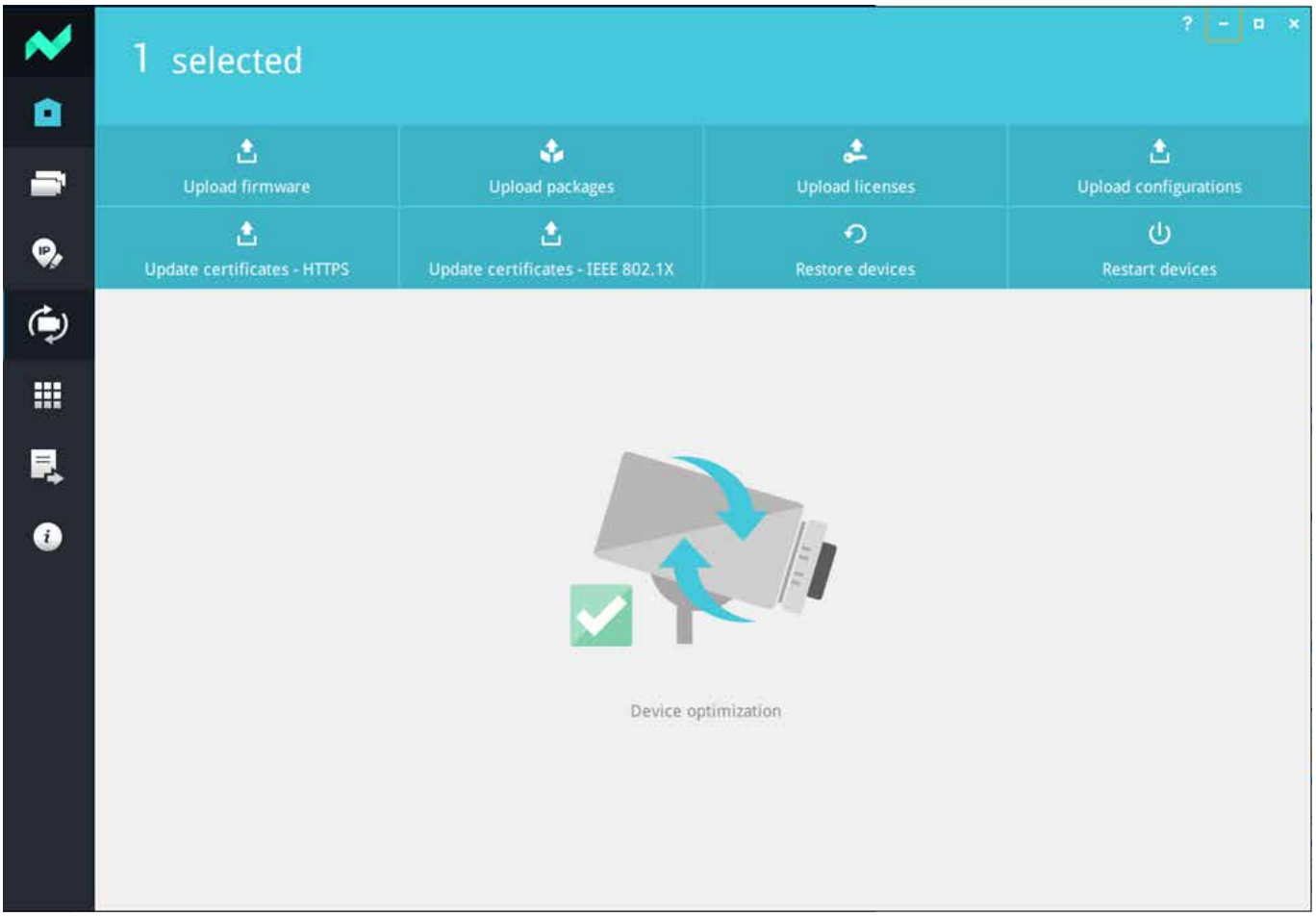
Uploading Specific Deep learning VCA Package

Uploading the package to several cameras

1. Download VIVOTEK camera management tool, Shepherd, from the official website: Shepherd - Application Software - Software :: VIVOTEK ::

2. Authorize the cameras on Shepherd.

3. Upload the VCA-xxxx.tar.gz file to several cameras in Maintenance.



Keep in mind that each camera model requires its specific file; attempting to upload the same file to different camera models may result in failure. For comprehensive instructions on how to utilize Shepherd effectively, please consult the manual. Ensure you follow the guidelines to achieve a seamless upload process.

VCA Licensing

Some Smart VCA rules require a purchased license to activate. Users can identify which rules need a license by referring to the "License Requirement Table" available in the link. To check the license status of each camera, navigate to the "License" page in the Deep Learning VCA package.

VCA licenses can be purchased through VIVOTEK sales. After completing your purchase, you will receive an email containing a link to download or activate the license. Follow the steps provided in the email to complete the activation process.

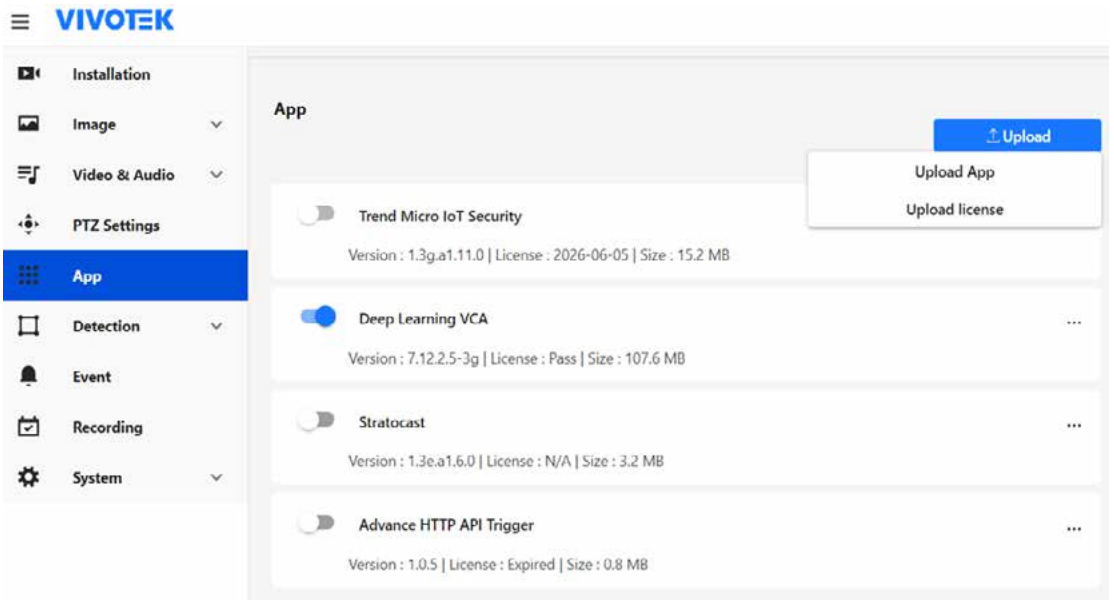
Note:
For detail VCA-rule, capability, and VMS feature support for different camera model, please refer the VCA quick reference table

Key Steps to Acquire Your License

1. Access the table to confirm the license needed for your desired VCA rules.
2. Go to the "License" page in the Deep Learning VCA package to view the current license status for each camera.
3. Purchase the appropriate license from the distributor contact.
4. After purchasing, check your email for a link and activation instructions.
5. Get the license file naming in the camera MAC.
6. Follow the provided steps to activate your license and enable the Smart VCA rules.

Upload license to a camera

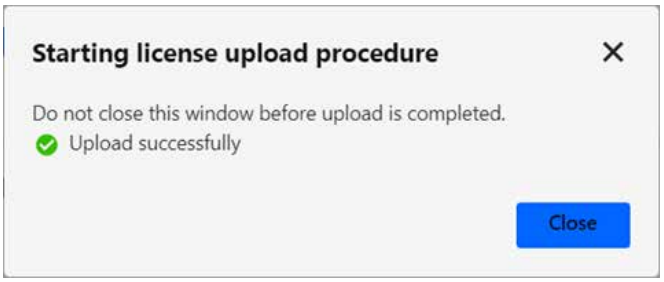
1. On the web console to the camera, navigate to the App and click on upload > upload license



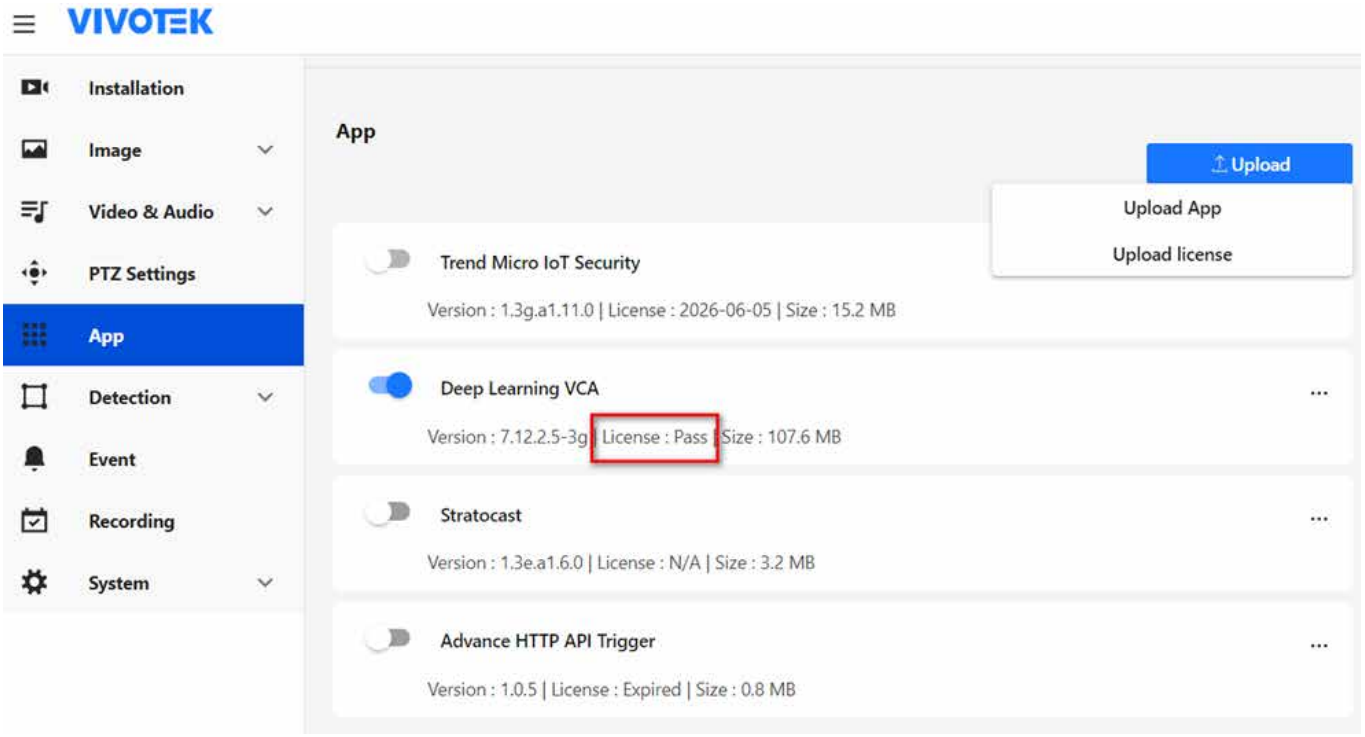
VCA Licensing

2. Click the upload file and then select the license file, then click Upload.

3. Close the window after you see the license upload successfully.



4. Back on the App page, you can see the license status is indicated as Pass.



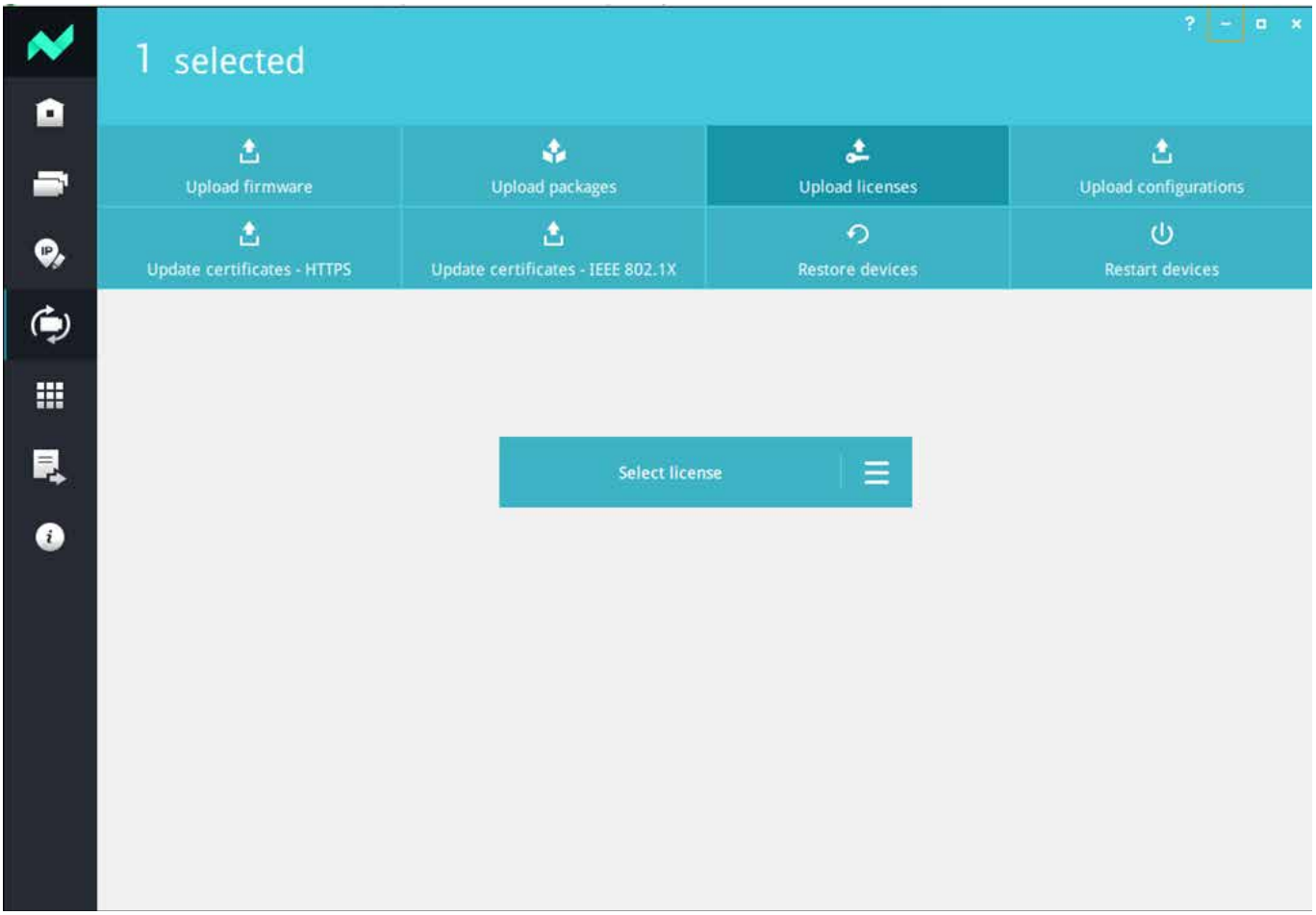
VCA Licensing

Batch upload license to several cameras

1. Download VIVOTEK camera management tool, Shepherd, from the official website:
Shepherd - Application Software - Software :: VIVOTEK ::

2. Authorize the cameras on Shepherd.

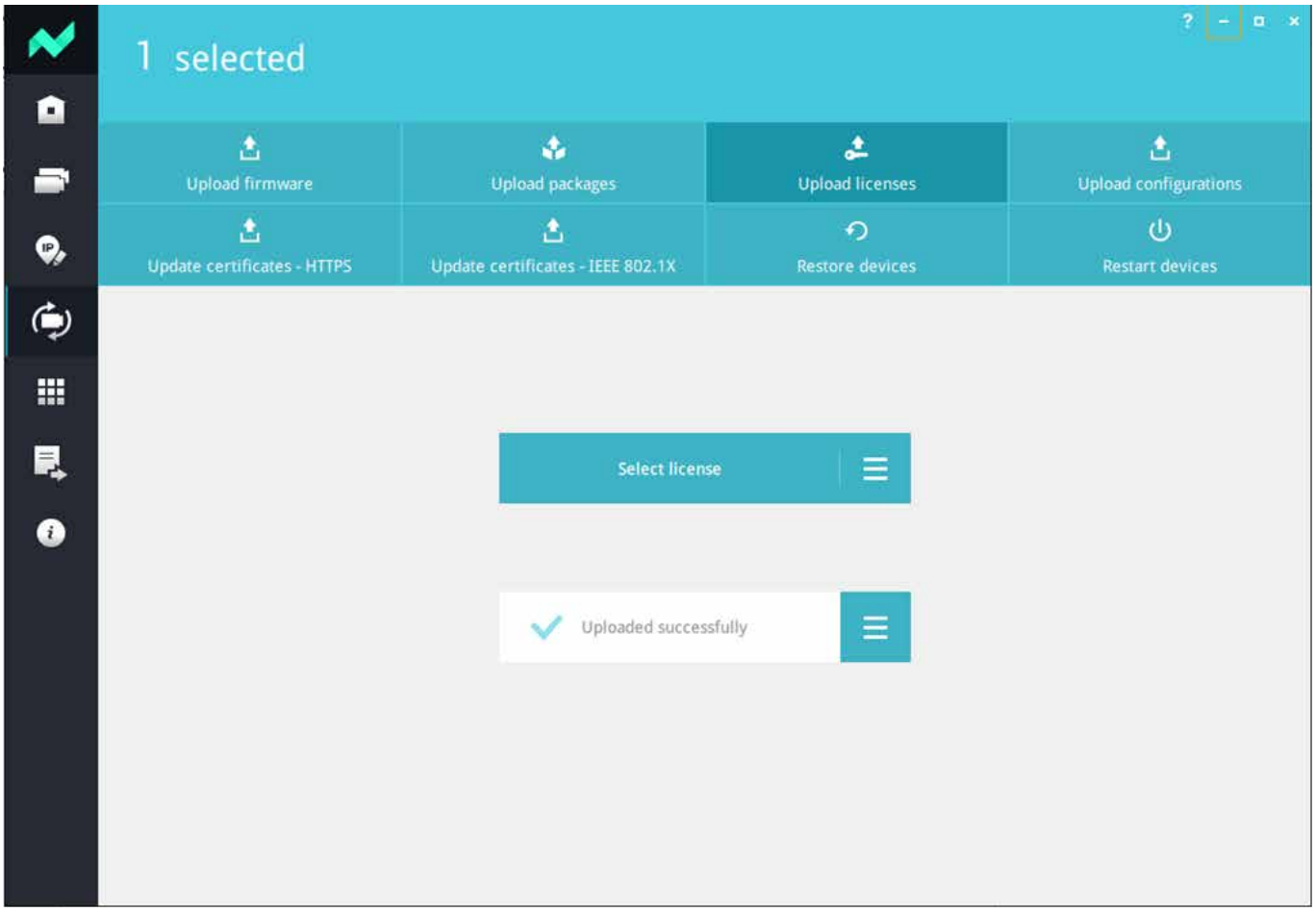
3. Go to maintenance and select Upload licenses.



VCA Licensing

4. Click “Select license” and then select all the license files.

5. Shepherd will upload licenses to the cameras automatically. It will show a successful message after process is finished.



Limitation

1. When using an HTTPS connection, you should stop and re-start the VCA after you upload a license.

Appendix

A1, Smart VCA - Rule Quick Reference Table

- **Event Object Type**

VCA Rules		People	Vehicle
Fundamental	Smart Motion	✓	✓
	Line Crossing	✓	✓
	Intrusion	✓	✓
	Loitering	✓	
	Face Detection	✓	
Fundamental	Missing Object Detection	✓	
	Unattended object detection	✓	
	Crowd Detection	✓	
Proactive Safety	Running Detection	✓	
	Restricted zone detection	✓	✓
	Parking Violation		✓

Appendix

A2, Deep search compatible info

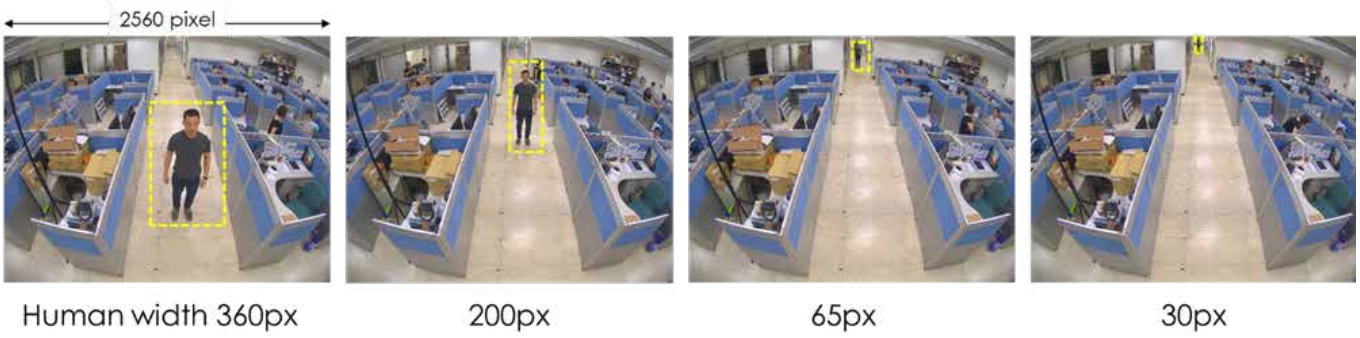
Products	Deep Search
Smart VCA	V7.9
VSS	V1.1
NVR (Only support Attribute search/Scene search)	V4.3
Milestone	VIVOTEK Deep Search for Milestone 2.2.1.1; Milestone Deep Search Plug-in 2.1.0.2
Genetec **(Only support Attribute search/Scene search)**	VIVOTEK Deep Search for Genetec 2.0.0.5

Appendix

A3, Quick Guide for VCA design tool

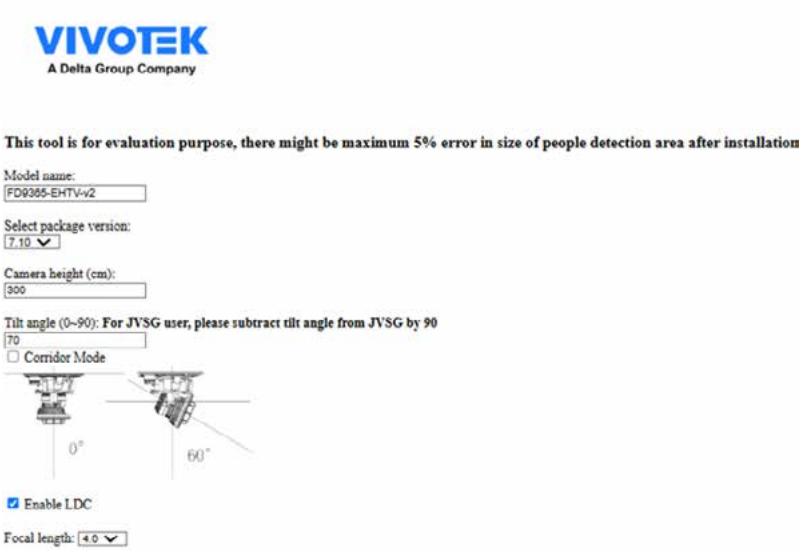
VIVOTEK deep learning VCA provide accurate people/vehicle detection function for proactive security surveillance. However, the detection area varies with camera model, installation height, and camera viewing angle (tilt & roll).

Since these 4 installation & setting parameters (height, tilt, roll, focal length) are used to construct the 3D model from 2D surveiliecne image, they each affect the range of human & vehicle detection that match the minimum people/vehicle detection pixels. VIVOTEK Provide a simulation tool website for user to calculate the specific human & vehicle detection area for camera selection and site design phase.



These images are taken by a 5-megapixel camera with the body width initially at 360 pixel. As I stand further away, while remaining the same resolution, the width of my body decreases in terms of pixel.

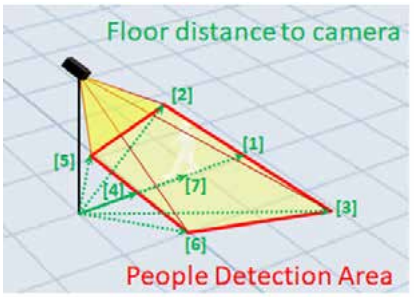
At a certain distance, the pixel density is too low to detect a human movement; therefore, at different set of parameters (height, tilt, rotation, focal length), there will be a boundary to provide effective human detection range.

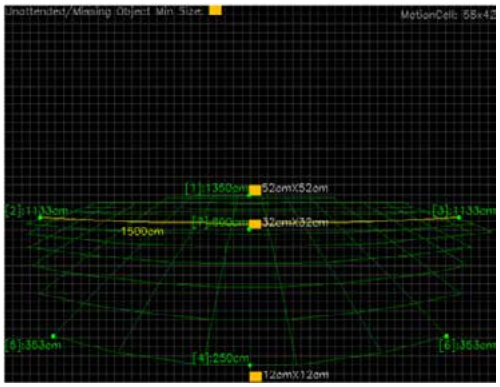
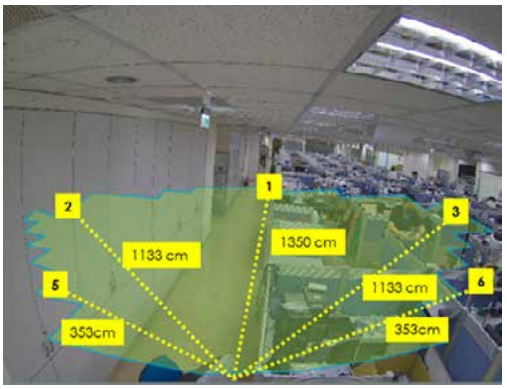
VIVOTEK VCA Design Tool Website
https://vca.vivotek.com/


Appendix

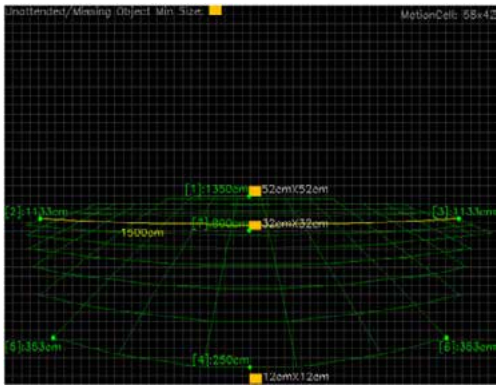
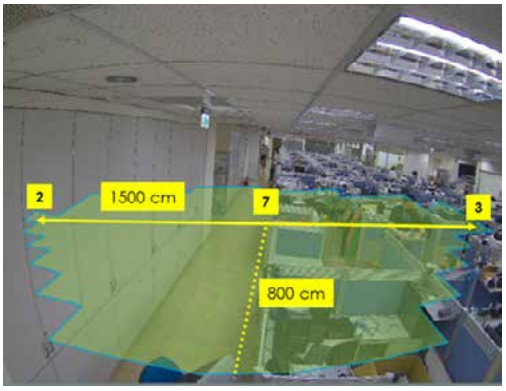
Detection Area

By selecting the camera model, VCA version, height, pose and focal length setting,it will give you 7 reference points for detection area. With these result, user can determine the space between cameras with well-covered VCA detection coverage.



Design Tool Simulation	Max Detection Area within FoV
	

Appendix

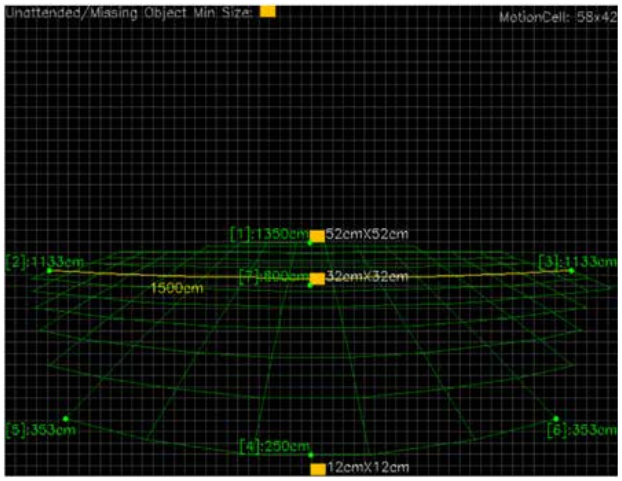
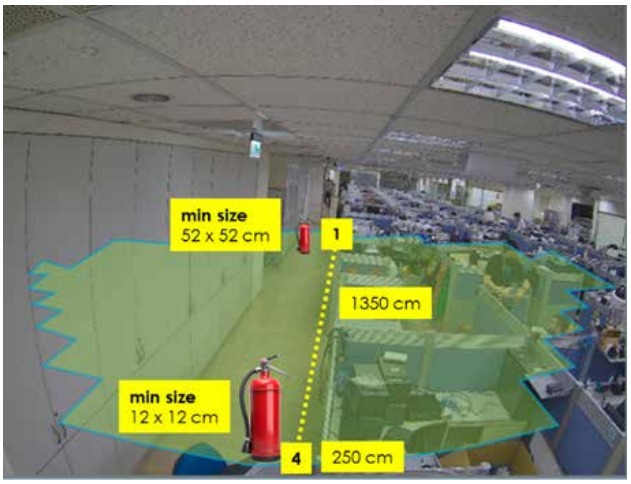
Design Tool Simulation	Max Width & its Distance
	

The maximum width of human detection area is displayed by the horizontal yellow grid. Therefore, the maximum width for this human detection area is 15 meters; the maximum length is 13.5 meters for a standard people & vehicle.

Standard People & Vehicle for Reference	
People	175 cm Height Human
Vehicle	Common Car with 4.6 m in Length

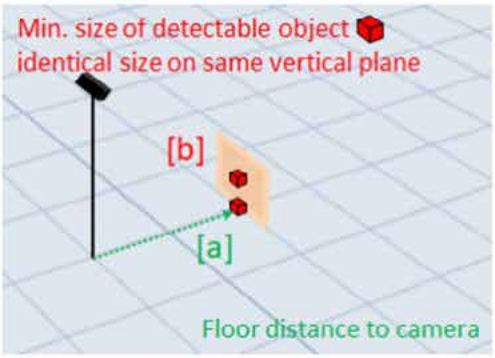
Appendix

Missing / Unattend Object Detection Area

Design Tool Simulation	Max Detection Area within FoV
	

For missing and unattended object detection, the simulation tool will give you the minimum size requirement at the closest and the farthest range for reference. If you have specific place to monitor or specific object, user can utilize the “Minimum size of maximum distance Calculator”or evaluate the scene.

- **Minimum size of maximum distance Calculator for object detection**



Please enter floor distance[a] from unattended/missing object to camera: 200 cm
->Minimum detectable unattended/missing object size[b]:**14** cm X **14** cm

Please enter the length of short side of unattended/missing object[b] to detect: 60 cm (max to 3000cm)
(e.g. enter 50cm if object size is 50cm X 70cm or 70cm X 50cm)
->Maximum floor distance[a] from unattended/missing object to camera:**1395** cm

Calculate

Appendix

If user knows the objects position or size, VIVOTEK VCA tool also provide a calculator for providing reference info for setting.

- Input the distance for minimum size reference.
- Input size for maximum distance reference.

Example: Length of short size

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