



A Delta Group Company

Smart Motion Detection

User Guide

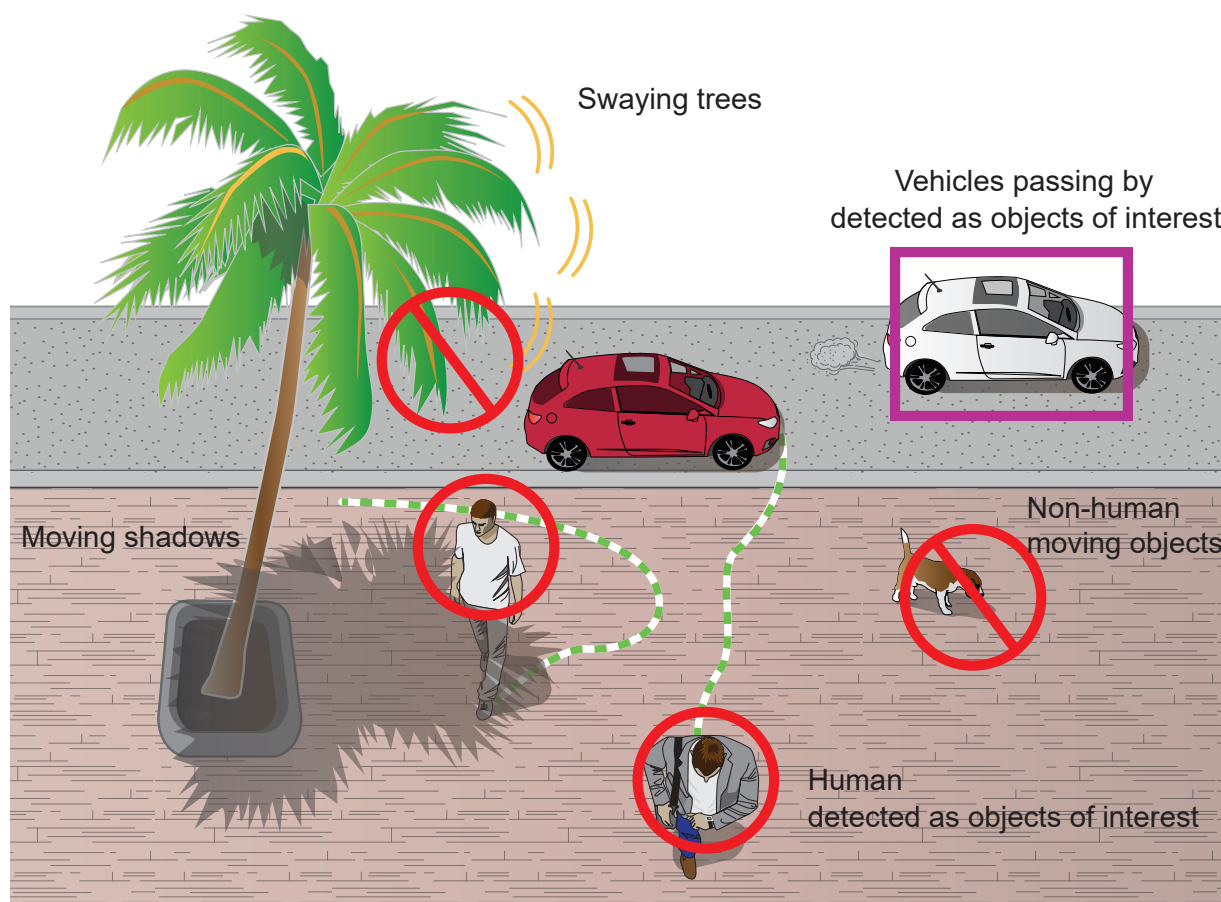
Rev.: 1.3

SW rev.: 6.17

The traditional motion detection relies heavily on the detection of pixel changes or motion vectors, and false alarms can be triggered by swaying trees, clouds floating by, or even the appearance of little animals. The Smart Motion detection, with Human / Vehicle detection and tunable time filter, can eliminate the defects of traditional motion detection and facilitate the configuration at a surveillance site.

A key feature in the Smart Motion detection is the Human detection. Based on a human silhouette database and the rapid responses via an artificial neural network technology, the Smart engine instantly recognizes human appearances in a video surveillance area. Since humans or vehicles are the objects of interest in the majority of video surveillance, the Human and Vehicle detection feature enables users to quickly configure his installation.

With Human detection, light changes or swaying vegetation, or animal activities in the scene are not taken as event triggers. Only human or vehicle activities will trigger an event. This helps reduce false alarms and the time and efforts for a camera configuration.

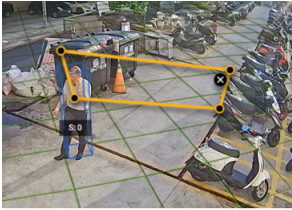


The activity data collected by the camera is displayed in comprehensive graphs and bar charts. You can monitor and compare the historical data acquired through a span of time and fine-tune the detection parameters with the ease of use of a graphical interface.

A Short Comparison between Smart Motion and Smart VCA

Smart VCA rule is a 3D rule that is drawn on the virtual floor and needs to be triggered within the detection area.

An object or human's feet must travel across various detection rules (line or zones) to trigger an alarm. For example, if a person is detected as a human in scene, but his feet is not in the detection area, he cannot trigger the rule.



In terms of Smart Motion:

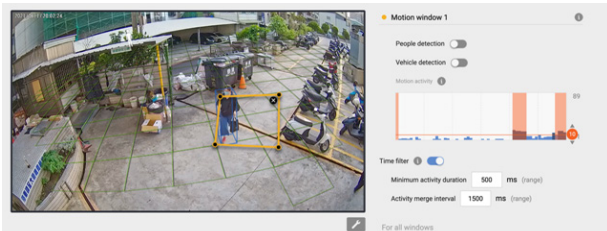
The **Smart Motion** is an enhancement from traditional Motion Detection.

If the People Detection feature is turned off, Smart Motion works as a normal or more-agile motion detection .

The triggering rule depends on how many motion cells have been activated in the motion window. The rule does not consider human characteristics such as feet, head, or shoulders.

When the People Detection is enabled, the human silhouette algorithms determines whether it is human's presence or activities that triggered the motions in scene.

When enabled, human's presence within the motion windows will be a trigger.



Revision History

- Rev. 1.0: Initial release
- Rev. 1.1:
 - * The Human Detection feature can be enabled/disabled on each individual motion window.
 - * Supports configuration in the MS9390 panoramic field of view.
 - * If the Motion window is located outside of the optimal human detection area, the Human Detection feature checkbox is automatically disabled.
 - * Motion window statuses have been adjusted. See page 20.
- Rev. 1.2:
 - * Added the Vehicle detection functionality, and updated the related UI changes.

■ Rev. 1.3:

- * Added the note for sharing the same Installation Reference function and the Settings > Configuration window.



IMPORTANT:

Requirements for Running the Smart Motion Detection:

1. The embedded video tracking requires a monitoring session on Chrome, Microsoft Edge browser. Note that Chrome does not support H.265 streaming.
If you open a console with a non-IE browser, the Smart Motion stream must be configured to be streaming in MJPEG.
2. Lens cleanliness is also required because dust spots or smears on dirty lens can produce miscalculation of pixels, correlation, and movements.
3. For other installation concerns, please refer to page 9, Considerations.
4. Avoid glass and reflective materials, such as aluminum foils, in the field of view. If unavoidable, you can use the Exclusive area settings to get rid of the side effects.
5. Make sure the camera is installed appropriately above the area of your interest, e.g., an entrance to building. Installation at an extremely busy area, e.g., a square or cross road section with dozens of passengers per minute, may not apply due to the system computing load.
6. Due to the system load, do not open two configuration web consoles at the same time.



NOTE:

1. The effectiveness of the Smart Motion detection slightly diminishes for objects lower than 130cm, such as children.
2. The accuracy of vehicle detection is lower for large trucks or trailers. It works best for smaller vehicles moving in a perpendicular direction to the field of view.
3. For VCA running on MS9390, the VCA is turned off by default. When running VCA, the frame rate will be reduced. You can manually turn on the VCA if preferred.
4. When using an HTTPS connection, you should stop and re-start the VCA after you upload a license.

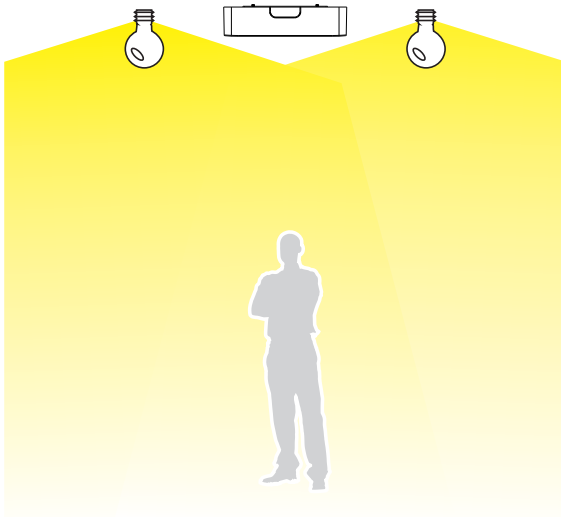
Applicable Cameras:

Please refer to VIVOTEK's VCA package and camera documentation on the website. The majority of VIVOTEK's latest camera models will come embedded with this utility.

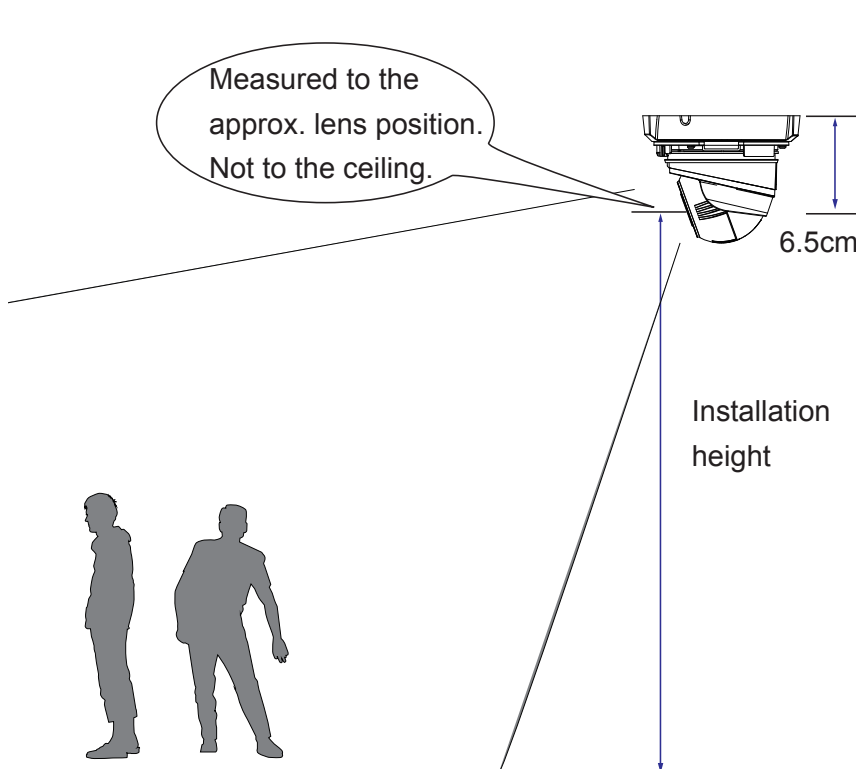
Considerations

Note the following when planning the camera installation:

1. The installation site must be adequately lighted for optimal accuracy with video detection. For example, a black car in a shaded area may not be adequately detected.
2. In the night mode, configure a schedule profile for the different lighting condition. In the night mode, the Smart Motion works if additional lighting is provided, e.g., using the on-board IR light.



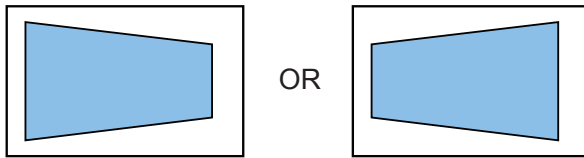
3. Make sure you measure the height of your camera. The height information is important for the accuracy of the video analytics results. Some of the other perspective information are automatically collected by the onboard S-sensor. The height information enables the horizontal and vertical keystone corrections of the field of view. Measure the distance between camera lens and the ground.



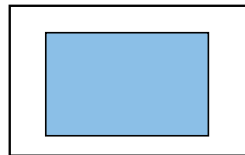
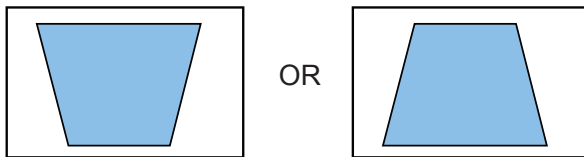
3. Because the horizontal and vertical keystone corrections are performed for an accurate detection, the height and tilt information of the camera must be correctly configured.

Use a laser distance meter to measure the installation height. The height information **MUST BE** correctly measured and entered in the camera's configuration page.

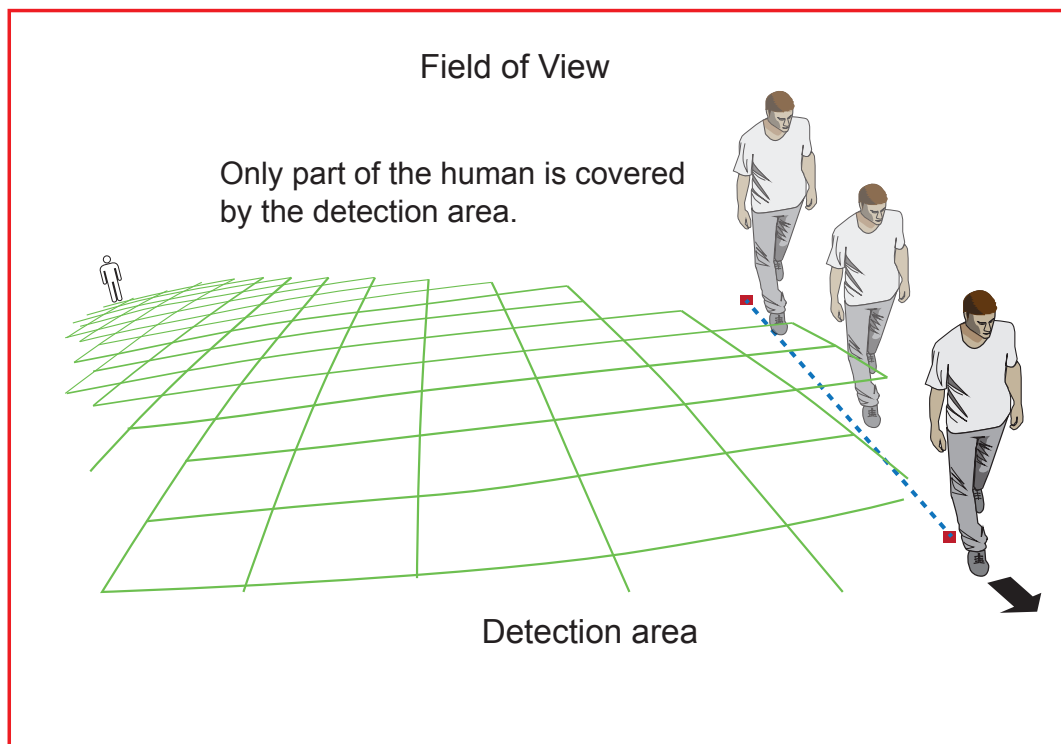
Horizontal keystone correction



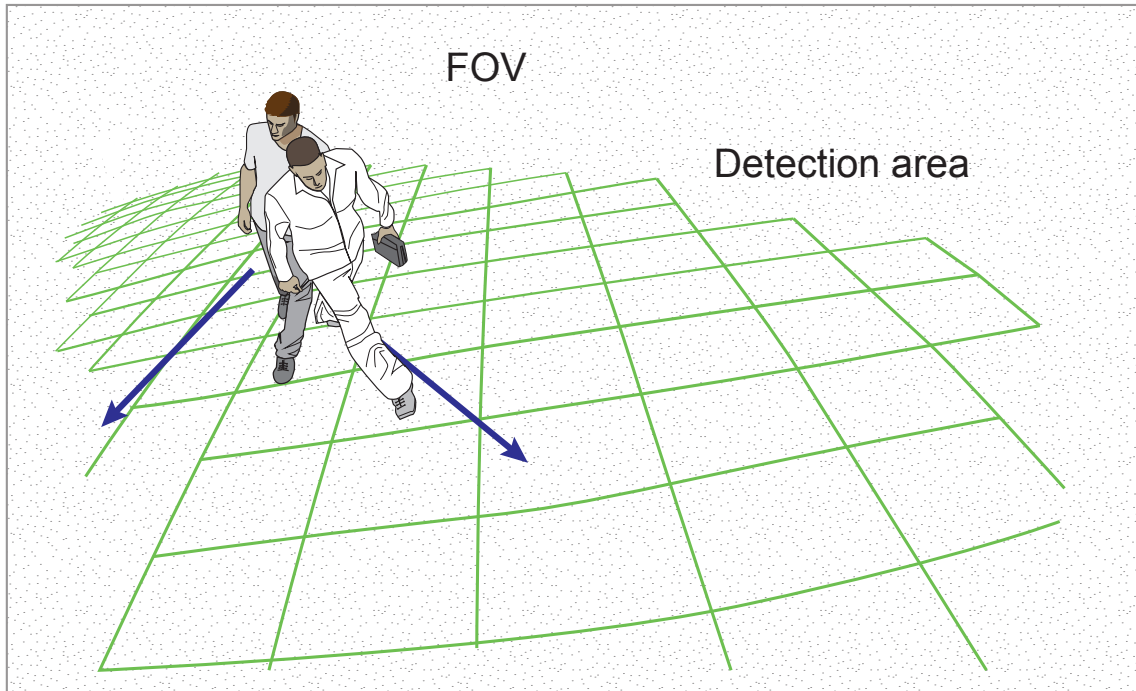
Vertical keystone correction



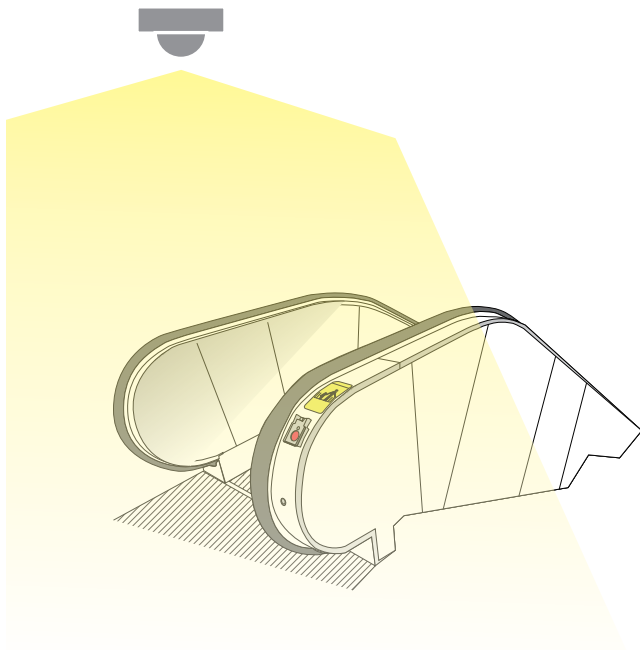
4. For Human detection, as long as a human silhouette is detected in the field of view, and his feet travelled through the Human detection area, he can be detected. Due to the visual perspective of lens, sometimes the entire body may not be covered by the detection area.



- Due to the optic concave characteristics of a lens, men can be temporarily blocked behind other men. When a man's head-shoulder feature is concealed, he may not be detected for the short moment.



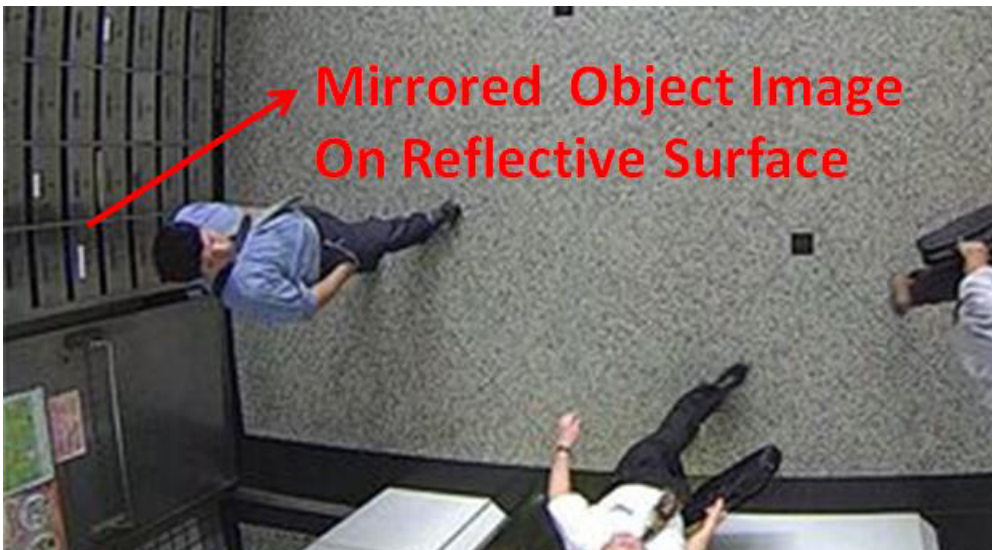
5. A man sitting, squated, or men lying on the floor may not be detected as a human, because his silhouette has been destroyed. Detection may also be affected when a human form is changed, e.g., a man's body is hidden behind a counter, or a man showing only the upper half of his body by leaning on a desk.
6. If the Human detection feature is not used, unnecessary objects should be avoided. A door, a floating curtain, and moving objects such as an escalator can cause mistakes with the detection.



7. The Human detection takes effects with standing or walking people. There is a limitation that the detection may not handle more than 30 people in the field. The field of view cannot cover a terraced structure or slope.

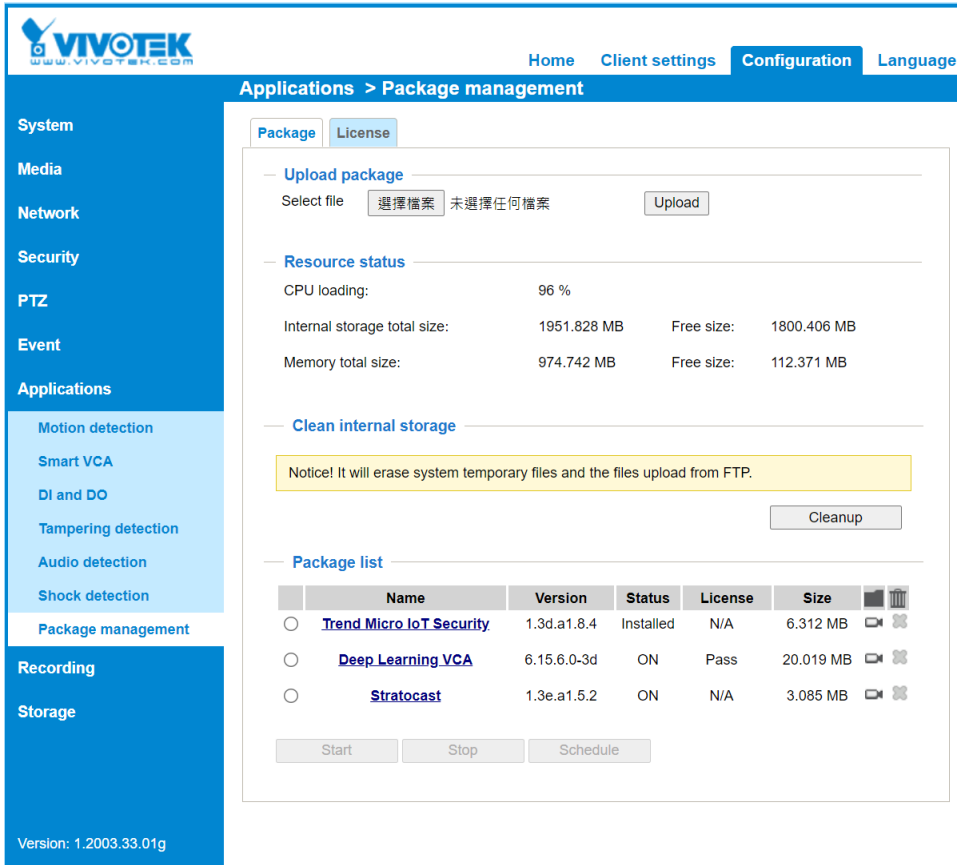


8. Some other possible sources of interference may include: shadows on the wall, mirrored object image on the reflective surface.

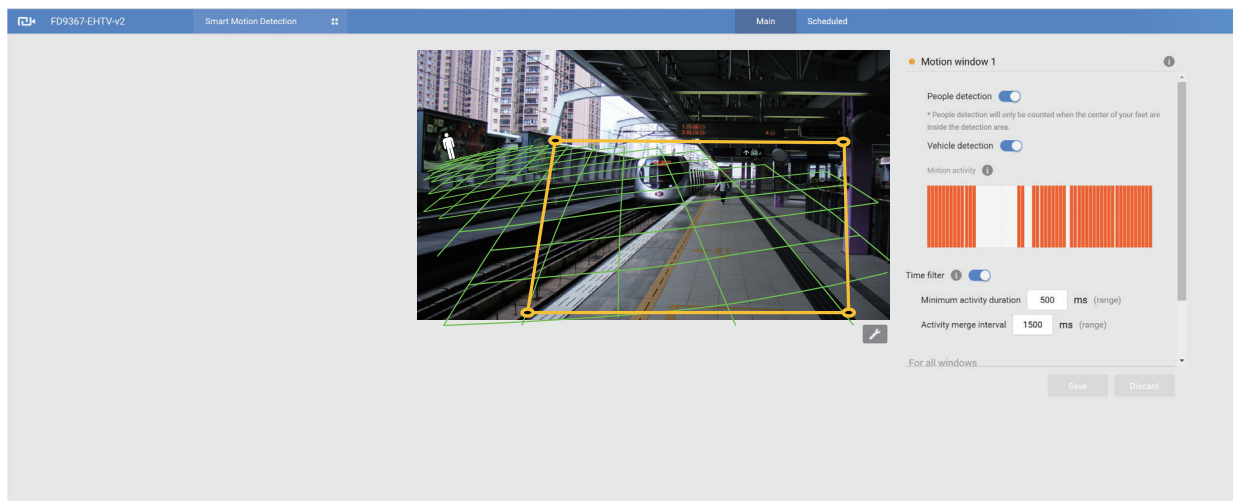


Configuration:

1. Open a web console to the camera. Enter the **Configuration > Applications > Package management** page. Click on **VCA package** to open the monitoring and configuration page. You can also access the feature through **Configuration > Applications > Motion detection**.



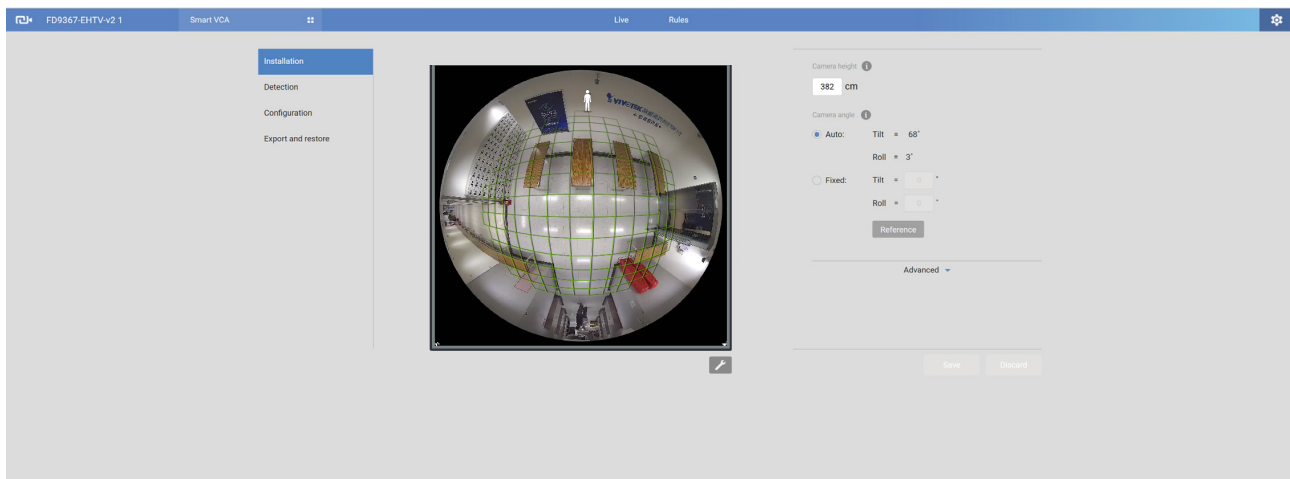
2. The utility defaults to the Main page. Click on the Settings button on the upper-right corner to enter the Settings page. Note that if the Human detection feature is not enabled, the Human detection area does not display.



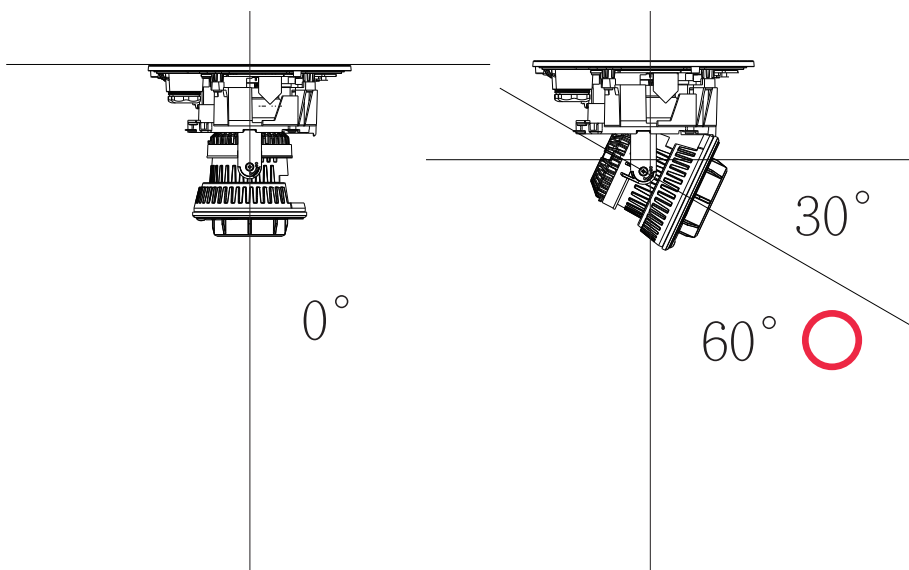
4. Enter the correct installation height. Please select the Auto mode for the camera to automatically acquire the shooting angles (Tilt and Roll). Many of the VCA cameras come with a G sensor, which allows an automated calibration. Users are not suggested to use the Manual mode to configure the tilt and roll angles.

Should you observe unsatisfying readings from the Auto mode, select the **Fixed** option, and Click on the **Reference** button for the camera to acquire the installation related parameters. The Auto mode brings out the calibrated results, while the **Reference** function brings out the original engineering readings by the G sensor.

If using models that are not equipped with a G sensor, you can manually enter the tilt and roll angles. When done, click the Save button.



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 degree. If your camera lens is tilted, enter the angle related to the vertical line, e.g., 60° as shown below.

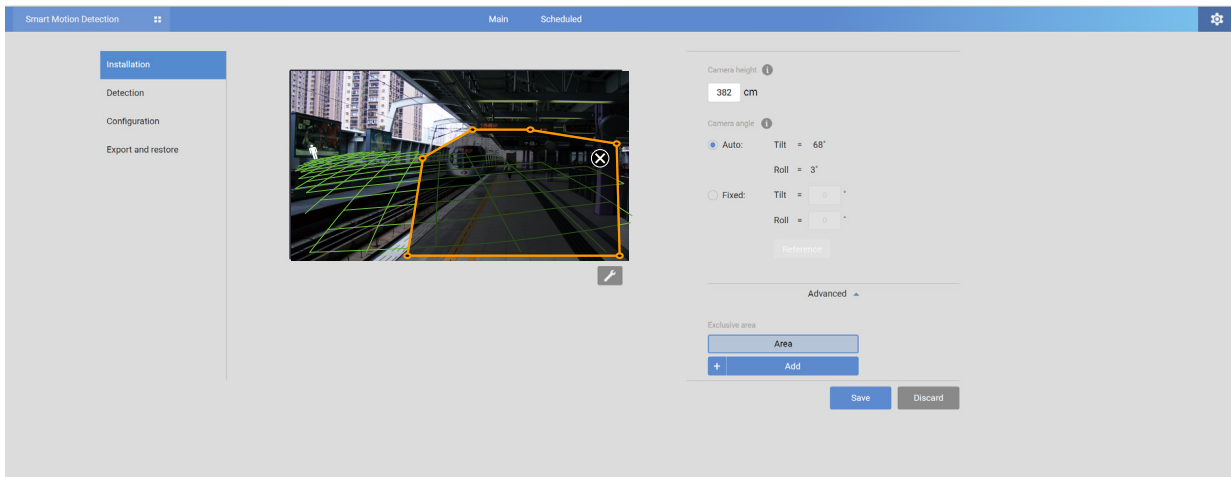


The roll angle is one that refers to the horizontal level line.

Exclusive Areas

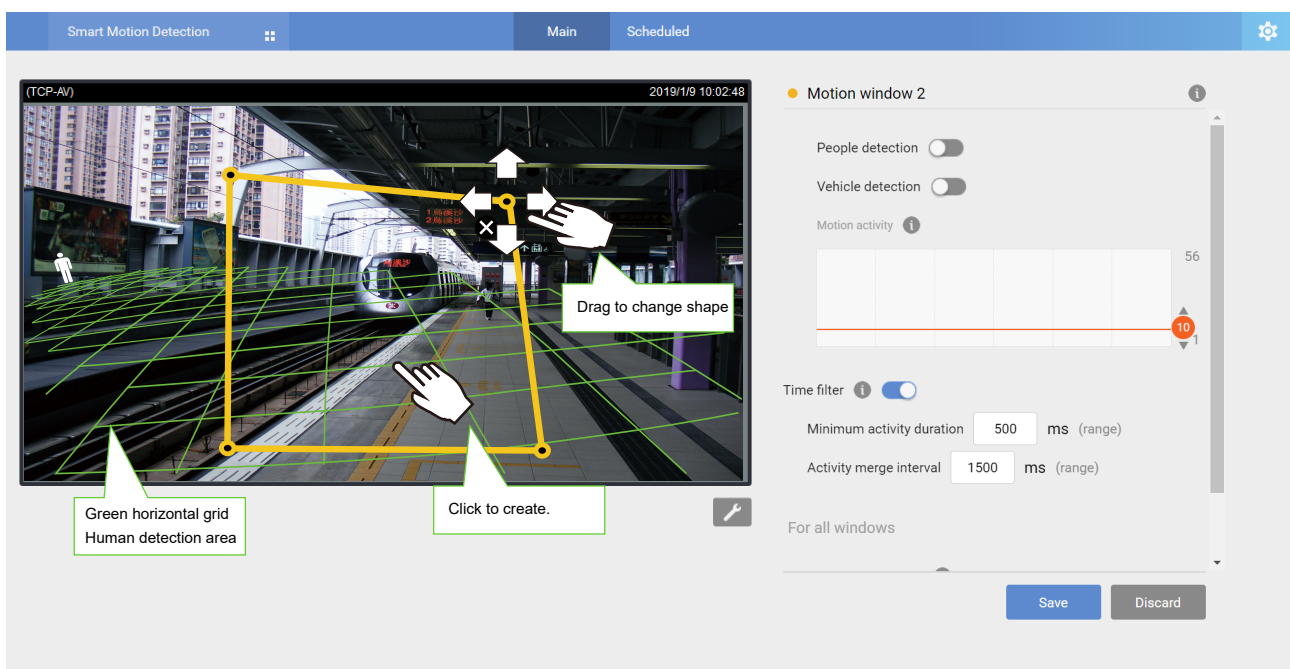
Click the Add area button **Add** to add an Exclusive area. Sometimes there are non-related elements in your field of view, such as a white wall where no one can walk on it or a fish pond with reflective water surface. You can add exclusive areas to block out the unnecessary elements in scene.

Use mouse clicks on the screen to draw polygons to create Exclusive areas. Click Save to preserve your settings.



4. When done, click **Save** to preserve your settings.

5. Click on the streaming window to create a detection window. Click to draw a detection window on the screen. Drag the corner marks to re-shape to cover the area of your interest. If the need should arise, you can create up to **5** detection windows.



Change the coverage area of the window by dragging the corner marks. Note that the coverage area should comply with the Human detection area. The Human detection area is indicated by the red, dotted line.

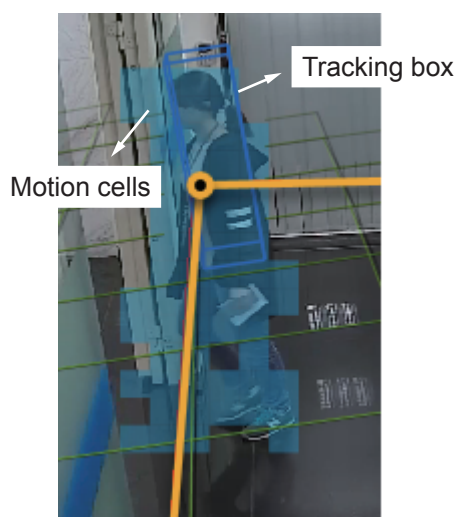
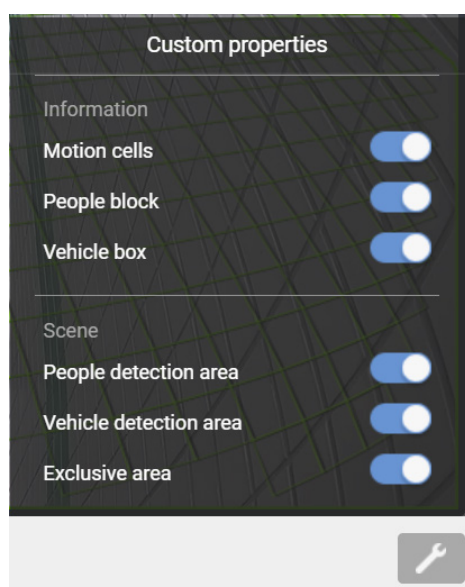
The display elements can be configured in the **Custom properties** pane:

- * **Motion cells**: The alerted vectors that appear when a moving object appears in scene.
- * **People box**: The vertical bounding box surrounding a standing or walking human form.
- * **Vehicle box**: The square box surrounding a detected vehicle in scene.
- * **People detection area**: The green horizontal grid mesh is automatically generated according to the camera's FOV, installation height, tilt, and roll angles. It is designed to indicate the area where the effective human detection can take effect. Place your detection window within the green grid.

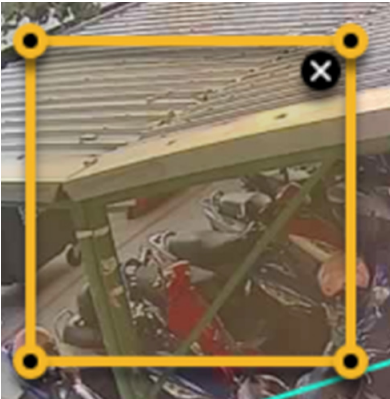
The approximate distance between any two of the green lines is 1 meter. The height of the little man on the upper left of the grid is approximately 1.7m.

* **Vehicle detection area**: Displays the green line encircling the effective range of vehicle detection area.

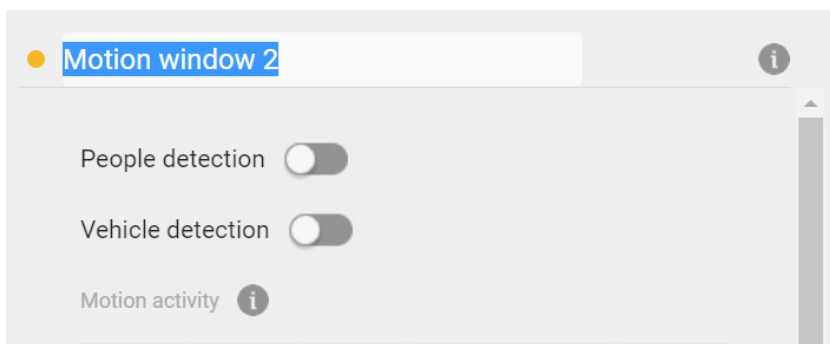
* **Exclusive Area**: Displays the Exclusive area(s) you created in the Settings page.



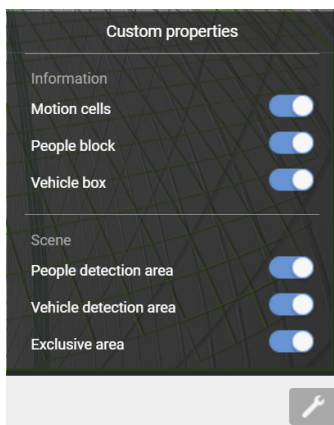
To remove an existing window, select and click on the X mark. A confirm box will prompt for the deletion of the window.



Click on the title bar to enter a name for the detection window.

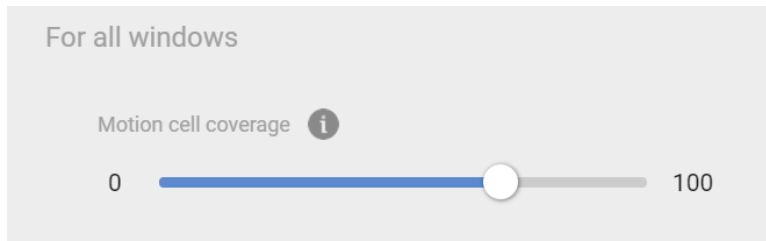


Click on the Tools button at the lower-right of the streaming window for the display options.

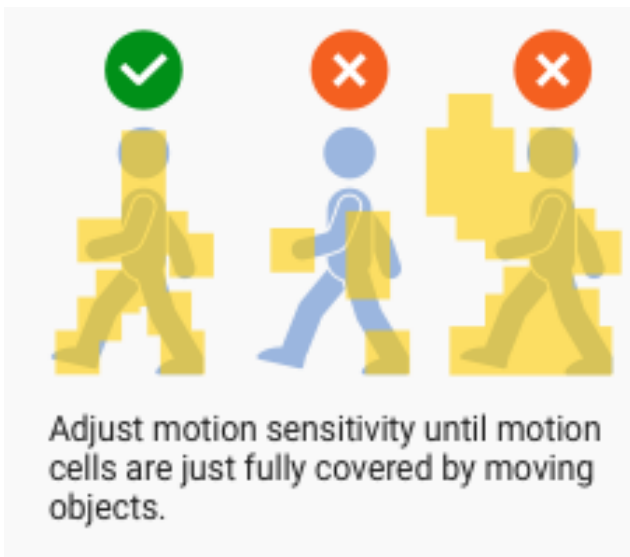


- **Show Motion Cells:** Displays the motion cells around a moving object. By default, when Human detection is enabled, the motion cells display is turned off.

6. Observe the human or vehicle traffic on screen and tune the sensitivity until the motion cells approximately match the human figures on screen. If you aim to detect larger objects, such as vehicles, the same applies. Tune the sensitivity so that the appearance of motion cells better coordinates the appearance of the objects of your interest.



Coordinated cells too few excessive cells



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

Shown below is the comparison of the same object detected through different sensitivity levels. At the sensitivity level 90, excessive motion cells can be observed; while at level 30, the detection ends up with insufficient motion cells.

Sensitivity: 90



Sensitivity: 30

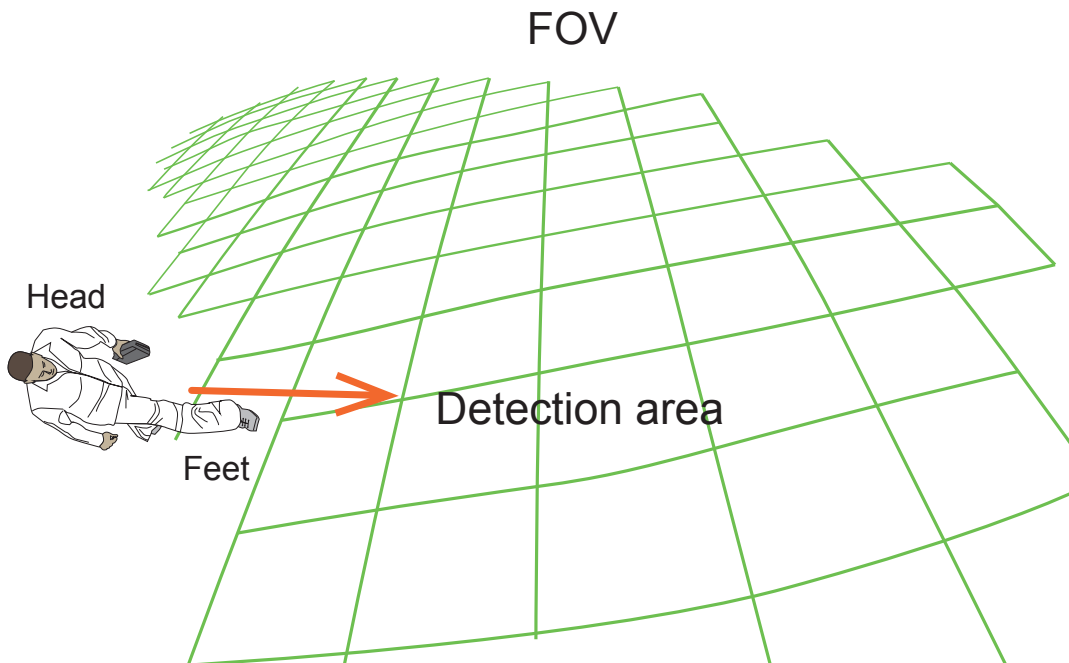


7. Configure the other parameters,

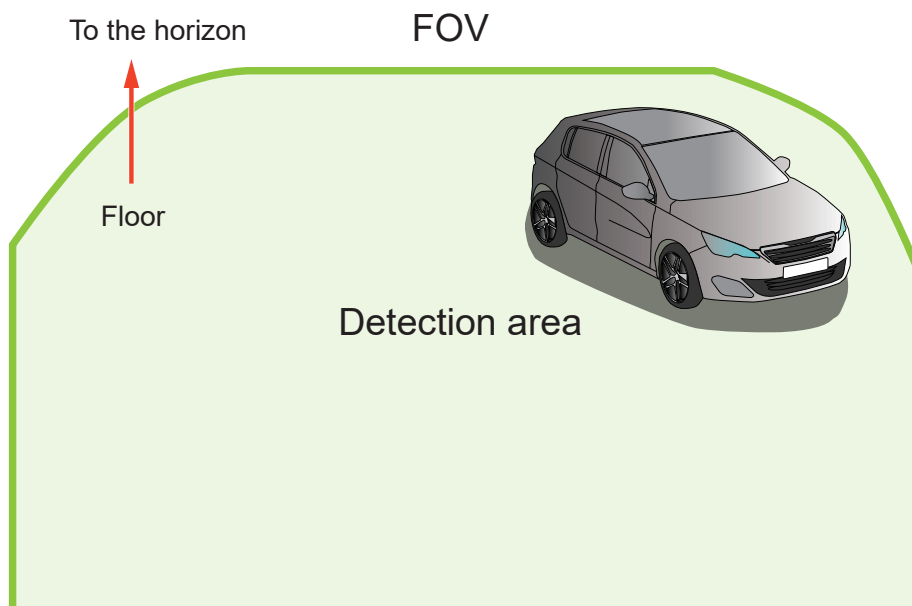
- **Show Human Detection Area:** Select to display the effective detection area currently detected by your camera.

Due to the visual perspective of the camera mounted on a ceiling or wall, a person enters the scene from the edge of the FOV with his feet appearing first, and then his/her head later. Only until he/she comes to a place within the perimeter of the detection area, the head and feet positions can be aligned. A person's feet are detected first, and if a detection area is configured too close to the edges of FOV, a person may not be appropriately recognized when his/her entire body profile has not entered the detection area.

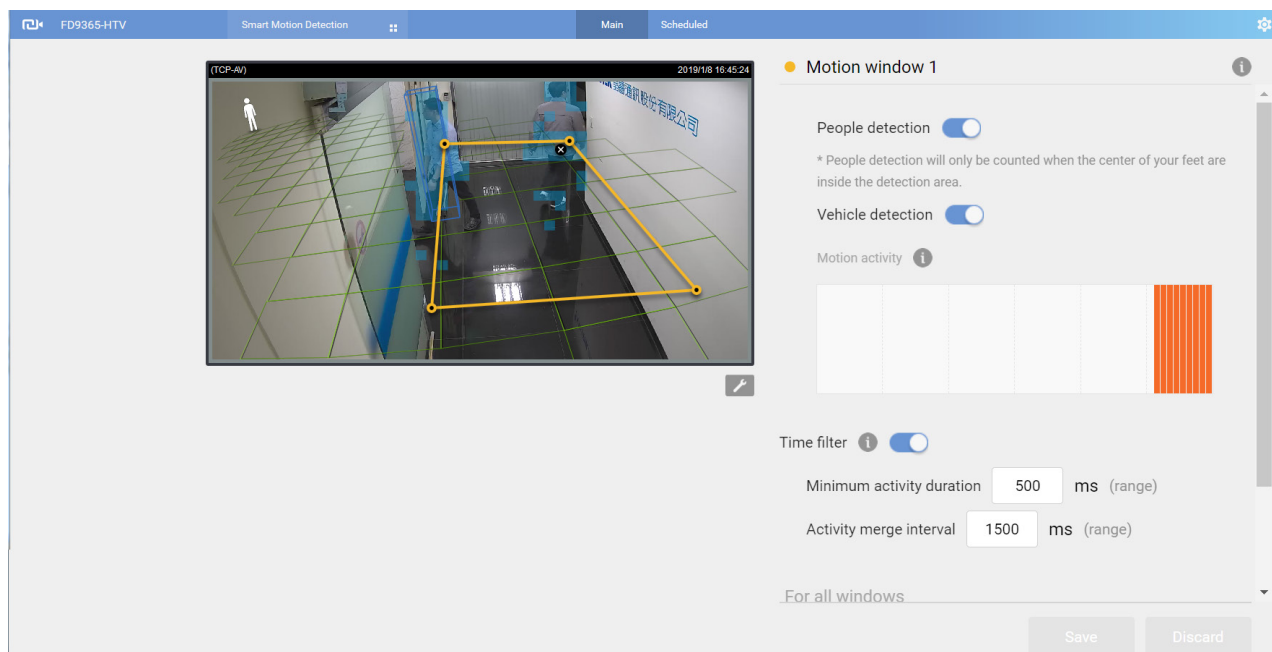
People crossing the non-Detection area may not be properly recognized by the Human Detection function. Humans must have their feet stepping into or across the detection area.



- **Show Vehicle Detection Area:** Select to display the effective detection area currently detected by your camera. The Detection area varies with different installation positions and shooting angles.



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

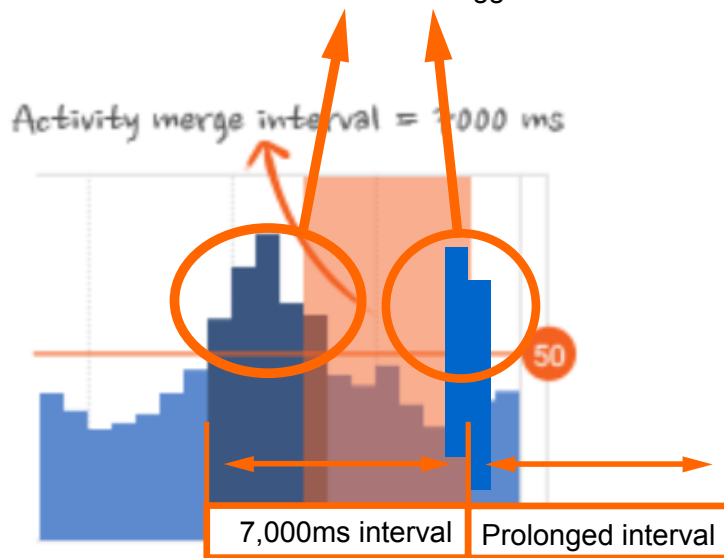


Time filter:

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.

Activity merge interval: Setting this interval aims to avoid the stop-and-move maneuver by some thieves. The activities occurred during this duration is 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.



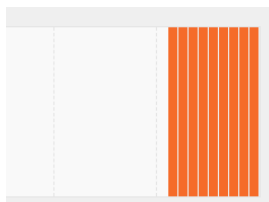
Tune the following if the need should arise. You can find the options in **Settings > Detection**.

- **People detection / Vehicle detection / Object detection :**
- **Sensitivity for all windows:** In real-world applications, the effectiveness of Human detection can be affected by the following:
 - Fast moving, running in the scene,
 - Linger at the edges of FOV,
 - People crouching or crawling.

In such situations, users can consider tuning the sensitivity towards "**Less missing objects**."

On the contrary, if tuned towards "**Less false alarms**," the detection algorithm will apply more strictly human silhouette matching. In some situations, such as when a man crouches down to pick up an object, he will be temporarily undetected.

Motion activity: The detected activities are displayed on a 1-minute time line. The consecutive 4 standing man icons indicate a detected presence persisted for 4 seconds.



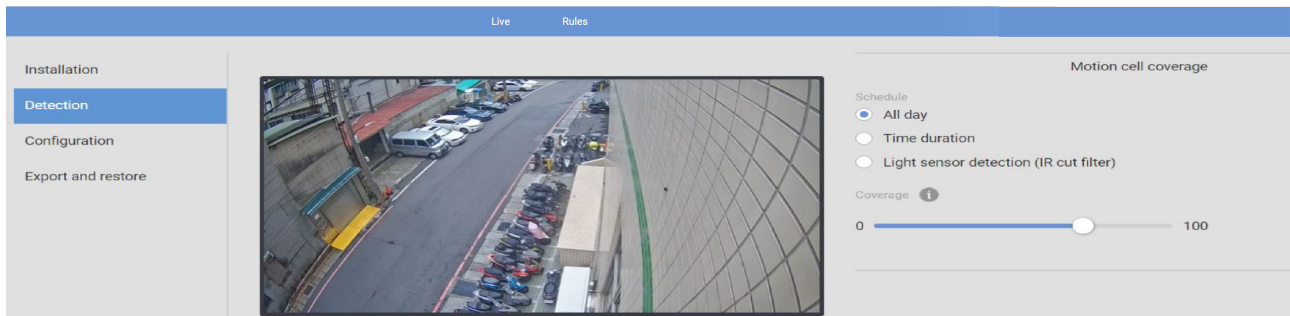
Note that when watching the activities, the Motion activity displays for a selected window. If you have multiple detection windows, and a window is currently not selected on screen, its activities do not display.

When activities occur, and the window is triggered, the window will be highlighted by turning the frame into red.

Options in the Settings Menus:

The **Settings** page also provides the generic tuning options. Refer to the following pages for configuration details. Note the Smart Motion detection and Smart VCA share the same Sensitivity parameters.

Settings > Detection (Motion Cell Coverage)



Depending on the different lighting conditions throughout a day, you can configure a different sensitivity for a specific span of time and individually for People detection, Vehicle detection, or Object detection. For day or night modes, you can configure different sensitivity settings in terms of [Less false alarms](#) or [Less missing people](#)(or Vehicle or Objects).

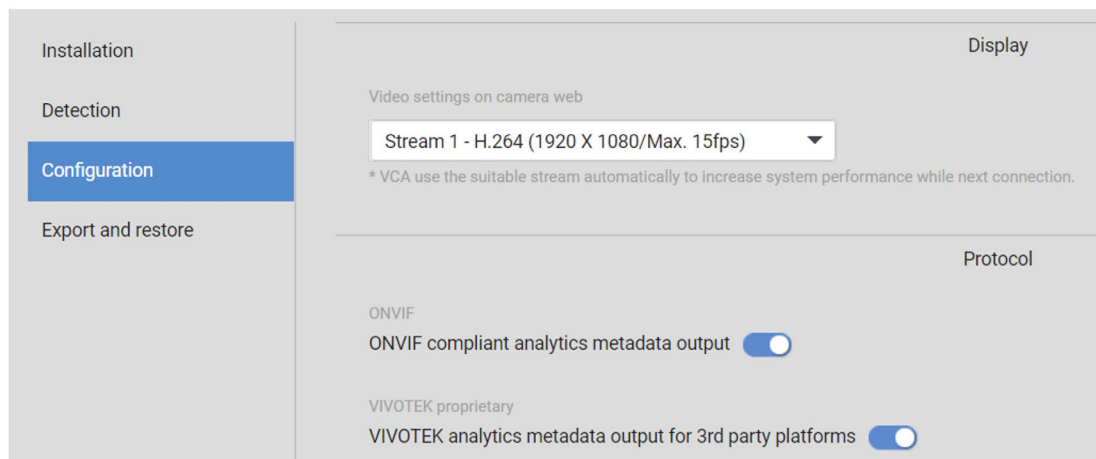
NOTE:

Since rev. 6.17, the motion cell settings for both Smart Motion detection and Smart VCA is accessed through the common Settings > Configuration window.

8. **Configuration > Display:** It is recommended you select a video stream your client side is using 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.

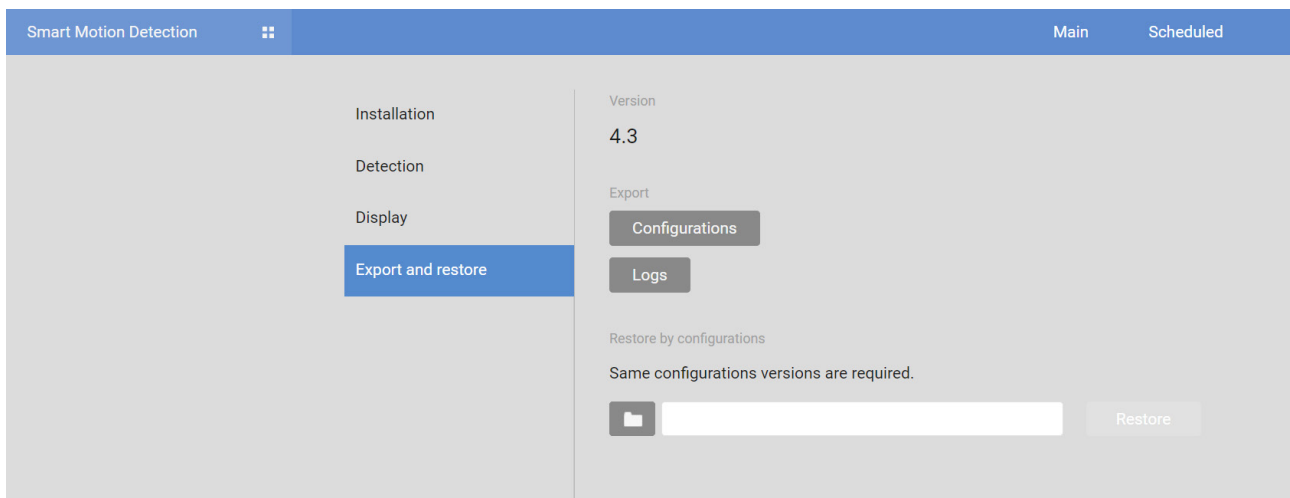
If streaming 1 is 5MP full resolution at 30fps, used for video recording. You configured VCA package to be using stream 3 full HD 30 fps, the camera SoC codec will have to handle stream 1 5MP 30fps + stream 3 full HD 30fps. It is therefore recommended to use the same stream for viewing, recording, and VCA.

Settings > Configuration



The **ONVIF** option is selected when you need to display detection details on 3rd-party software, such as Milestones. 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.

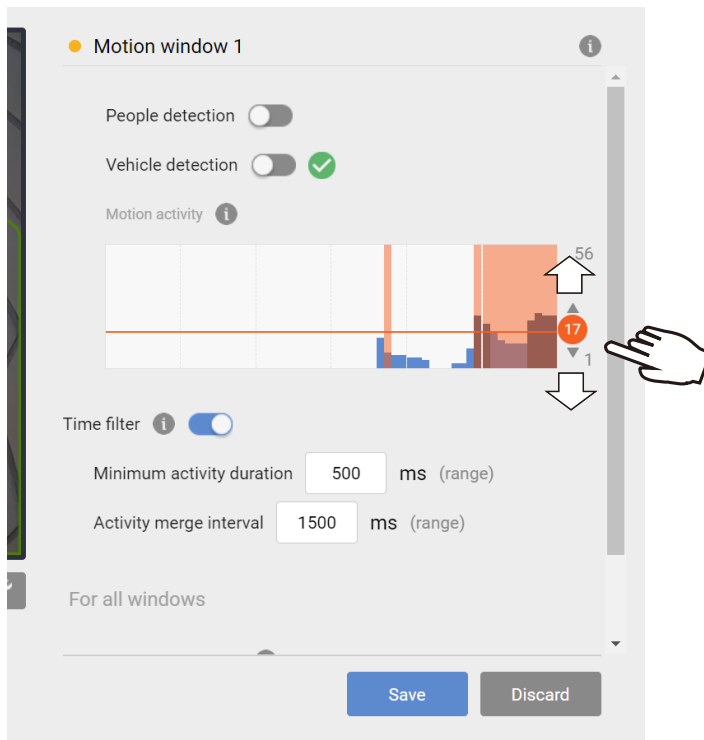
The **Export & restore** page can be used to save your configuration as a file. In some cases, your configuration can be repeatedly used at different locations. For example, when you install many cameras at the doors of train carts, you can use one configuration for the whole train. Since their positions are identical, one configuration file will apply to all.



You can also export system logs for debug purposes or detail examination.

Motion activity: (This option is available only if you disable **People** and **Vehicle** detection)

Click and drag the slide bar to change the detection threshold while watching the activities on screen. The activity chart covers a 61 seconds time span. The Y-axis indicates the percentage of alarmed pixels in the field of view.



The Motion sensitivity can be associated with object sizes. The higher the sensitivity, the smaller the object size can be detected. Change the trigger level if necessary, judging from the live view of your scene.

If you do not want motions to be triggered by small objects, e.g., little animals such as birds, configure a higher threshold.

People detection does not need this activity threshold setting. It works on the detection of the silhouettes of human body by an AI engine.

The blue bars indicate the activities within the surveillance scene. An effective trigger is indicated by a semi-transparent red bar.

Below are the statuses of the Smart Motion detection polygon:

Normal

Motion window (normal)



Selected by a mouse click. You can click on the delete button to remove a configured window.

Motion window (focus)



When motion is triggered in the window.

Motion window (trigger)



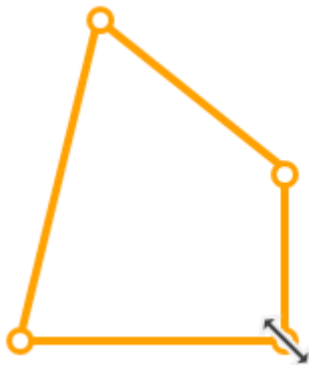
When moused over. You can edit the positions of the end points.

Motion window (hover on area)



Click and drag the end points to edit the coverage of the motion window.

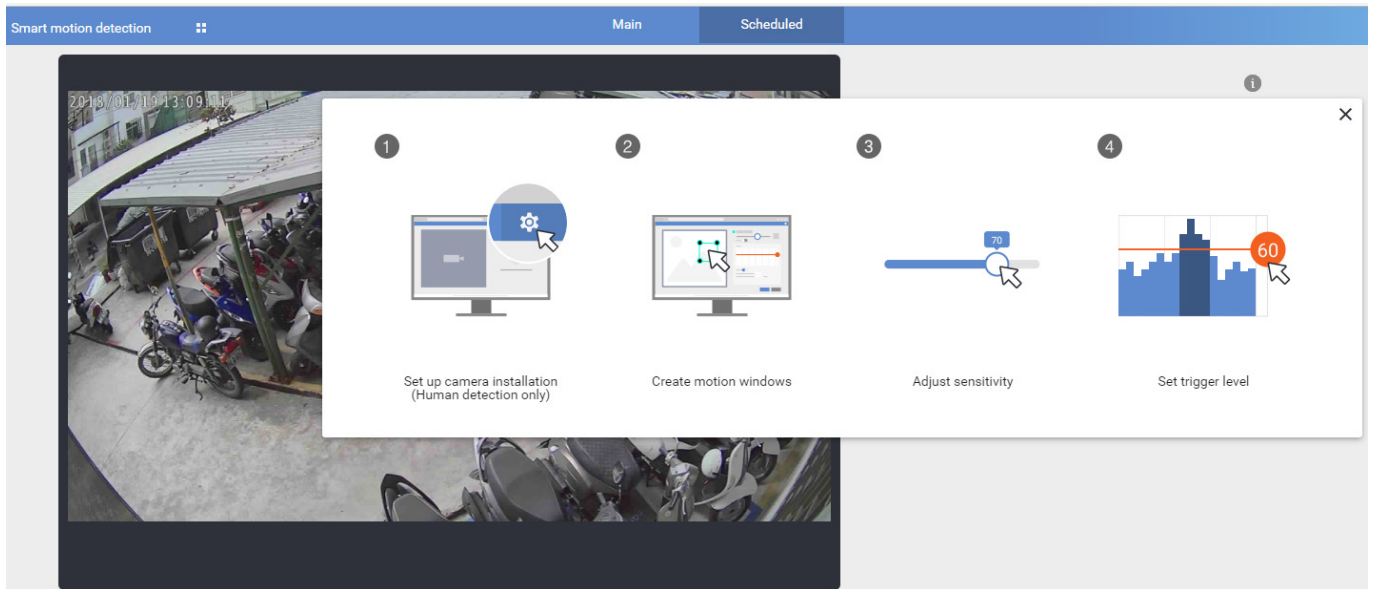
Motion window (hover on point)



Scheduled mode:

The Scheduled mode allows you to apply different motion detection configurations for different lighting conditions, such as in the night mode. Another 5 detection windows are available for the Scheduled mode. Individual trigger levels can be configured per window.

Click the Scheduled tab to open the Scheduled configuration window. An illustrated work flow will prompt.



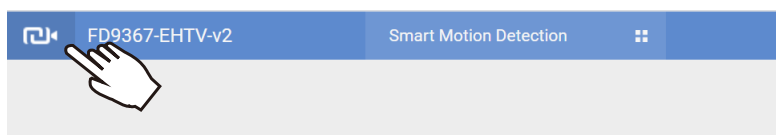
Use the same configuration methods as previously described to configure the detection in a scheduled mode. Note that In the night mode, the applicable sensitivity range tends to fall between middle and high.

Taking Actions with the Event

When Motion configuration is made, associate the event delivery with the occurrence of motion events. For example, you can configure the camera to record the related video clips by the time the motion event occurs, or sending an Email containing the snapshots of the event.



Click on the upper-left icon to return to camera web configuration console.



Configure the motion event notification in **Configuration > Event** settings.

Find your configured Motion detection in **Trigger > Video motion detection**. There can be many instances.

The screenshot shows the 'Trigger' configuration window for 'Video motion detection'. The window has a sidebar with three steps: '1. Schedule', '2. Trigger' (selected), and '3. Action'. The main area contains the following settings:

- ☒ Enable this event
- Priority: High (dropdown)
- Detect next motion detection or digital input after 15 second(s).
- Trigger**
 - ☒ Video motion detection
 - Normal: ☒ Motion window 1
 - Profile:
 - Note: Please configure [Motion detection](#) first
 - ☐ Periodically
 - ☐ Digital input
 - ☐ System boot
 - ☐ Recording notify
 - ☐ Audio detection
 - ☐ Camera tampering detection
 - ☐ Manual triggers
 - ☐ Shock detection
 - ☐ VADP
- [Set VADP Trigger](#) (button)

At the bottom right, there are 'Save event' and 'Close' buttons.

Configure the action when a motion event is triggered.

Event name:

☒ Enable this event

Priority:

Detect next motion detection or digital input after second(s).

1. Schedule

↓

2. Trigger

↓

3. Action

Action

☐ Trigger digital output for seconds

☐ Backup media if the network is disconnected

☐ Play audio clip : [Configure Audio clips](#)

☐ Configure [CameraLink](#)

Name	IP address	Action
<input checked="" type="checkbox"/> sd9374 tracking	10.66.108.12	Configure Camera link action

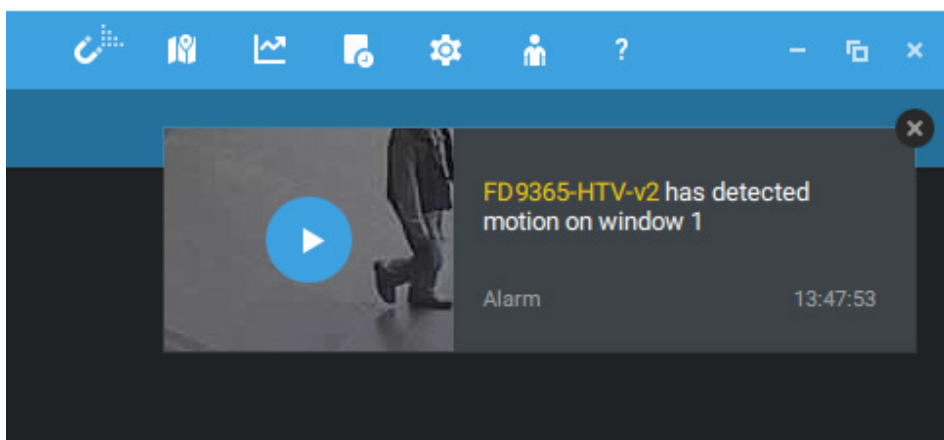
Server	Media	Extra parameter
<input checked="" type="checkbox"/> SD	<input type="text" value="----None-----"/>	SD test
<input type="checkbox"/> NAS0	<input type="text" value="----None-----"/>	Note: Please configure NAS management

When a motion event is triggered, you can,

1. Trigger a DO	to sound an alarm, etc.
2. Backup media if network is disconnected.	
3. Play audio clip to deter an intruder	an external speaker should be available.
4. Configure CameraLink	associate with another camera, e.g., a speed dome, telling it to move its lens to keep on tracking.
5. Send an Email	send an Email with a snapshot.
6. FTP	send a video clip to an FTP server.
7. SFTP	send a video clip to an SFTP server.
8. HTTP	send a snapshot or video clip to an HTTP server.
9. SD	save a snapshot or video clip to the SD card.
10. NAS	save a snapshot or video clip to a NAS storage.

Motion Events Seen through VAST2

Motion events prompt on VIVOTEK's central management software, VAST2. A single click on the event prompt can play back the related video footage.

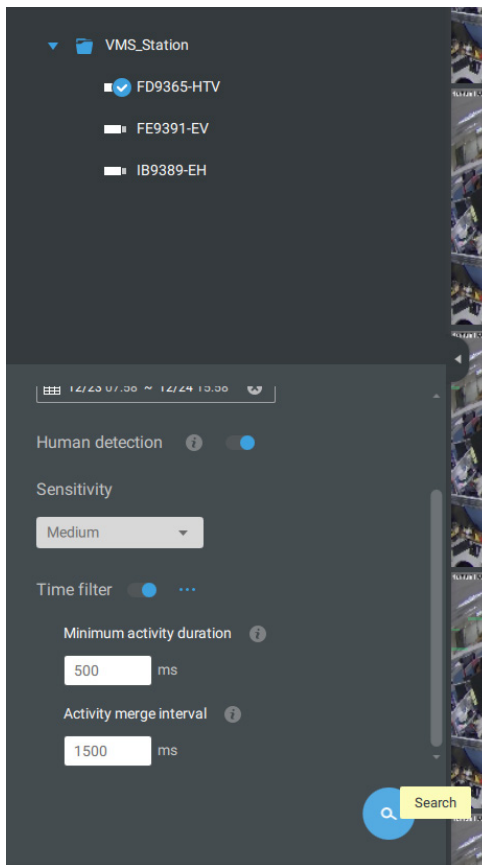


Motion events are tagged and can be retrieved from the event list using the Alarm list function.

Smart search II is available only for newer line of cameras that come with [Smart Motion detection](#). Smart search II has the following benefits:

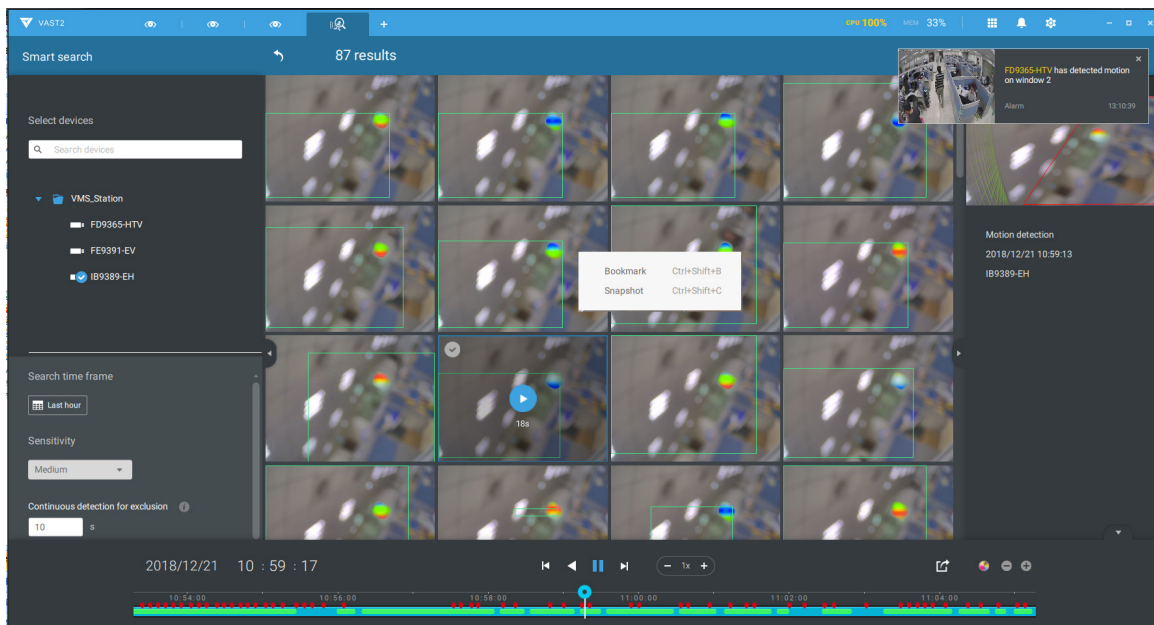
1. **Faster search**: Metadata is saved with videos coming from cameras running the Smart Motion detection. With the help of the metadata, the search focuses on the effective alerted vectors and the adverse effects, e.g., headlights causing dramatic contrast or small animals passing through, have already been eliminated by the camera. The search can be more rapidly completed.
2. **Human detection**: The search can be conducted for human activities only. Activities matching the silhouettes of human will be considered as effective results.
3. **Multiple multi-point polygons**: Users can more readily create flexible polygons on the areas of their interest.

Note that the Smart Motion detection areas must have been configured on each camera via a web console before the Smart search can take effect on VAST2.



You can specify the time span, Human detection, Sensitivity level, and time filter parameters in a Smart Search II panel.

You can then click to open any clip of your interest. Each marked event clip will be indicated by a lighter color on the time line. You may then right-click to add a Bookmark or take a snapshot.



If you find important events, use the Export function to mark the start and end points on the timeline to export a video clip. Use the pull tabs on time line to determine the export length. The default export length is 2 minutes long.

The playback control in the Alarm list window is identical to that on the Playback window.

