Video Analytics Manual

ZNS NVR

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Introduction

Ganz VCA is a real-time video analytics engine that utilizes advanced image processing algorithms to turn video into actionable intelligence. At the core of the product is an advanced object tracking engine that continually tracks moving and stationary targets. The tracking engine features built-in robustness to environmental nuisance conditions such as changing illumination, moving foliage, rippling water, etc.

Ganz VCA is a generic name for a suite of analytics products that include:

- **VCApresence**: continually tracks moving and stationary targets and generates real-time alerts of object presence in multiple overlapping detection zones.
- **VCAsurveillance**: continually tracks and classifies moving and stationary targets and features a full suite of rule-based filters including: enter, exit, appear, disappear, stopped objects, directionality constraints, object counting, loitering, object type and object speed. Multiple filters are supported on any combination of multiple overlapping detection zones.
- A full range of packages**:** optimized for specific scenarios. See the VCA Feature Packages topic for detailed information about the available packages.

Using the intuitive configuration, it's possible to quickly and easily define rules that generate real-time alerts when triggered.

This user guide will help you get Ganz Analytics quickly configured, as well as lead you through some of the advanced features provided by the product.

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Getting Started

In order to get up and running as fast as possible, the following steps should be executed:

- Ensure that your version of Ganz ZNS supports Analytics (version 2.5.0 and more recent versions).
- Obtain an activation token for the feature set required.
  - The features are described in the VCA Feature Packages topic.

- Activate the Analytics.
- Calibrate Analytics.
- Configure the detection rules.

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VCA Feature Packages

Ganz VCA functionality is available in a range of different packages. The license types are listed in the following table.

Analytics														
	No. detection zones	Tamper detect	Camera shake elimination	Sur-veillance tracker	Presence filter	Enter/Exit, Appear/Di-sappear + Stopped filters	Class and speed filters + calibration	Direction & dwell filters	Tail-gating filter	Abandoned object filter	On-screen counters	Object Meta data	Counting Line	Comment
Lower cost special function licenses														
VCAcountPCopen	40										✓		✓	Bi-directional counting in busy areas
Full licenses														
VCAadvancedPCopen	40	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	VCAsurveillance + Counting Line

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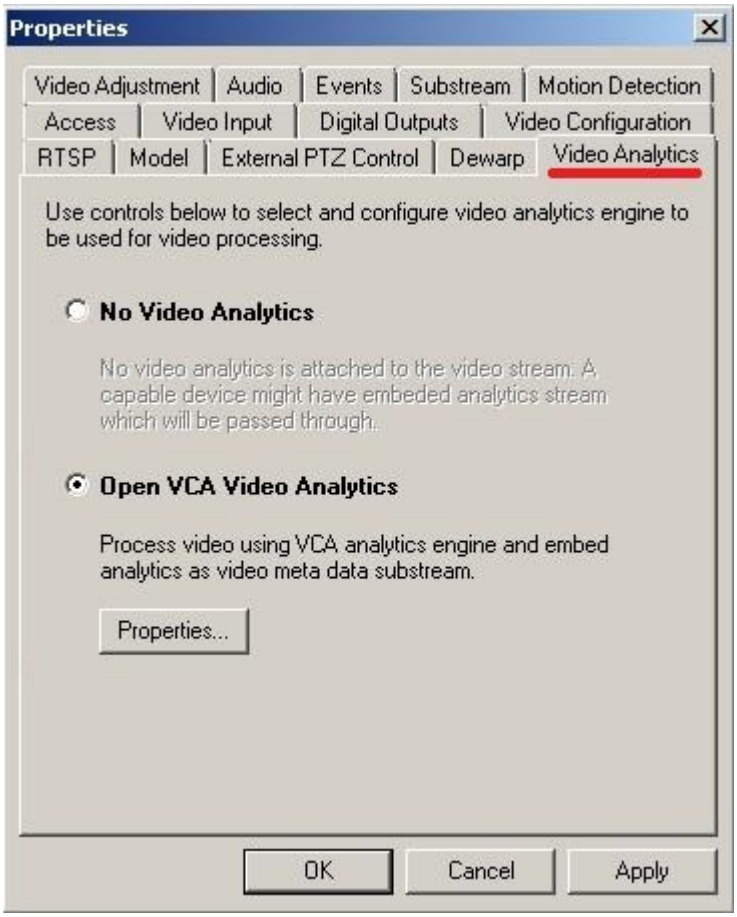
Accessing VCA Configuration

All configuration of the Ganz VCA engine is performed by accessing the Video Analytics tab in video stream properties:



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Activation

Activation

Features of Ganz VCA must be activated before they can be used. Activating VCA consists of the following two major steps:

- Obtaining an activation token from your distributor.
- Applying an Activation key in the software.

Obtaining an Activation key

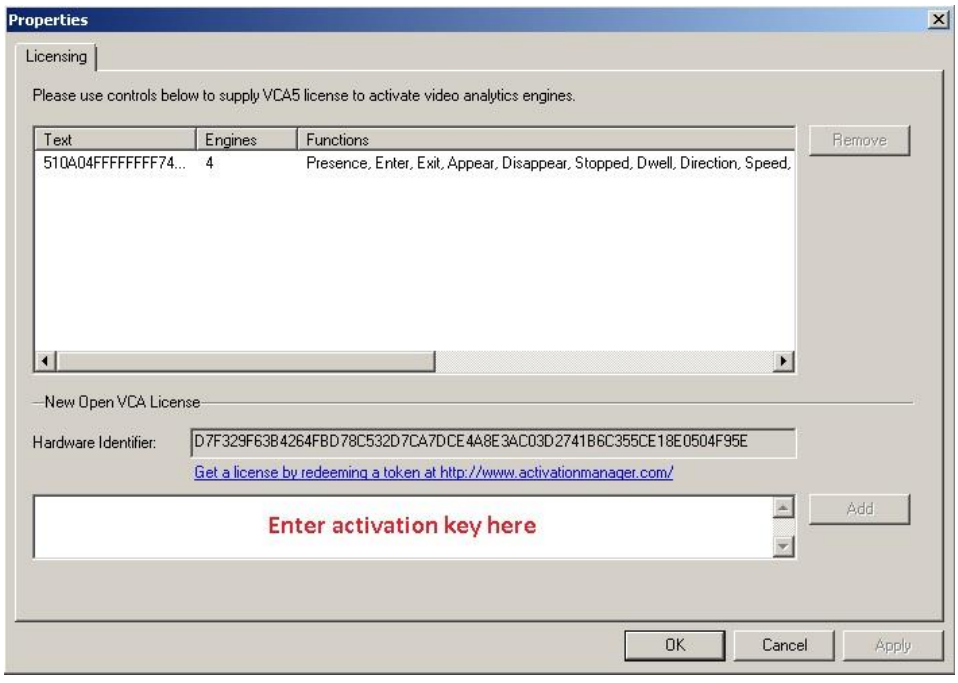
Before Ganz VCA can be used, it must be activated.

The full activation process:

1) Purchase VCA token from distributer.
2) Visit http://www.activationmanager.com in a web browser.
3) Enter the token ID and hardware ID.
4) The activation key will be generated.
5) Apply the activation key to the target system.

Applying an Activation key in Ganz ZNS

Once an activation key has been generated, it's simply a case of entering the code on the Engines and Licenses tab. Select the Add/Remove licenses link:



Enter the activation key and click "Apply". If the activation code is valid, the activated features will be displayed in the "Functions" column.

Please note that Ganz ZNS server must be restarted to enable analytics processing.

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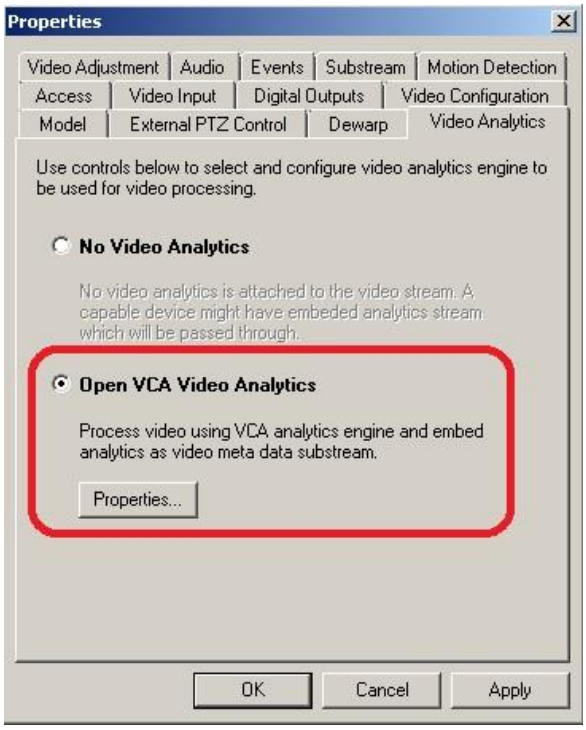
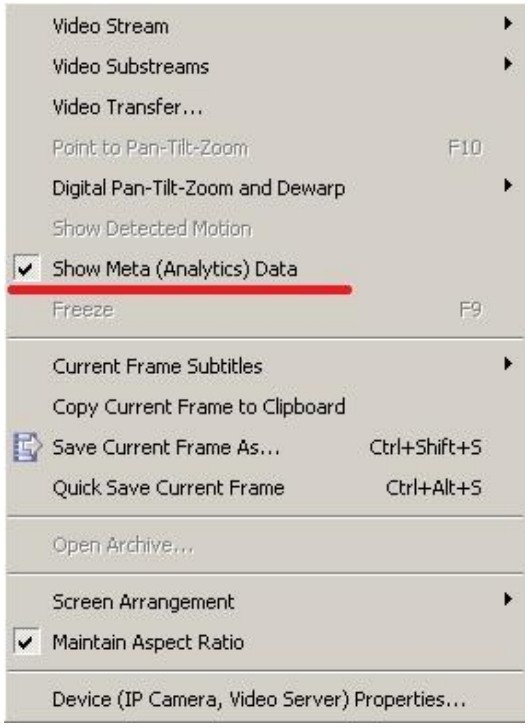
Enabling VCA

Switching VCA On and Off

By default, VCA is disabled. In order to enable VCA it must be activated. Select "Open VCA Video Analytics" in Video Analytics tab:





Enable VCA

Select/Deselect to enable/disable the VCA functionality at a global level. If "No Video Analytics" is selected, ALL VCA functionality will be disabled.

Note: Disabling VCA drops ALL settings.

Enabling Metadata Streaming

In order to visualize the VCA output, metadata streaming must be enabled for video stream. Select "Show Meta (Analytics) Data" by right-click on live view (see snapshot above).

Note: Meta data visualization requires that Microsoft XML Core Services 4.0 SP3 is available in the system.

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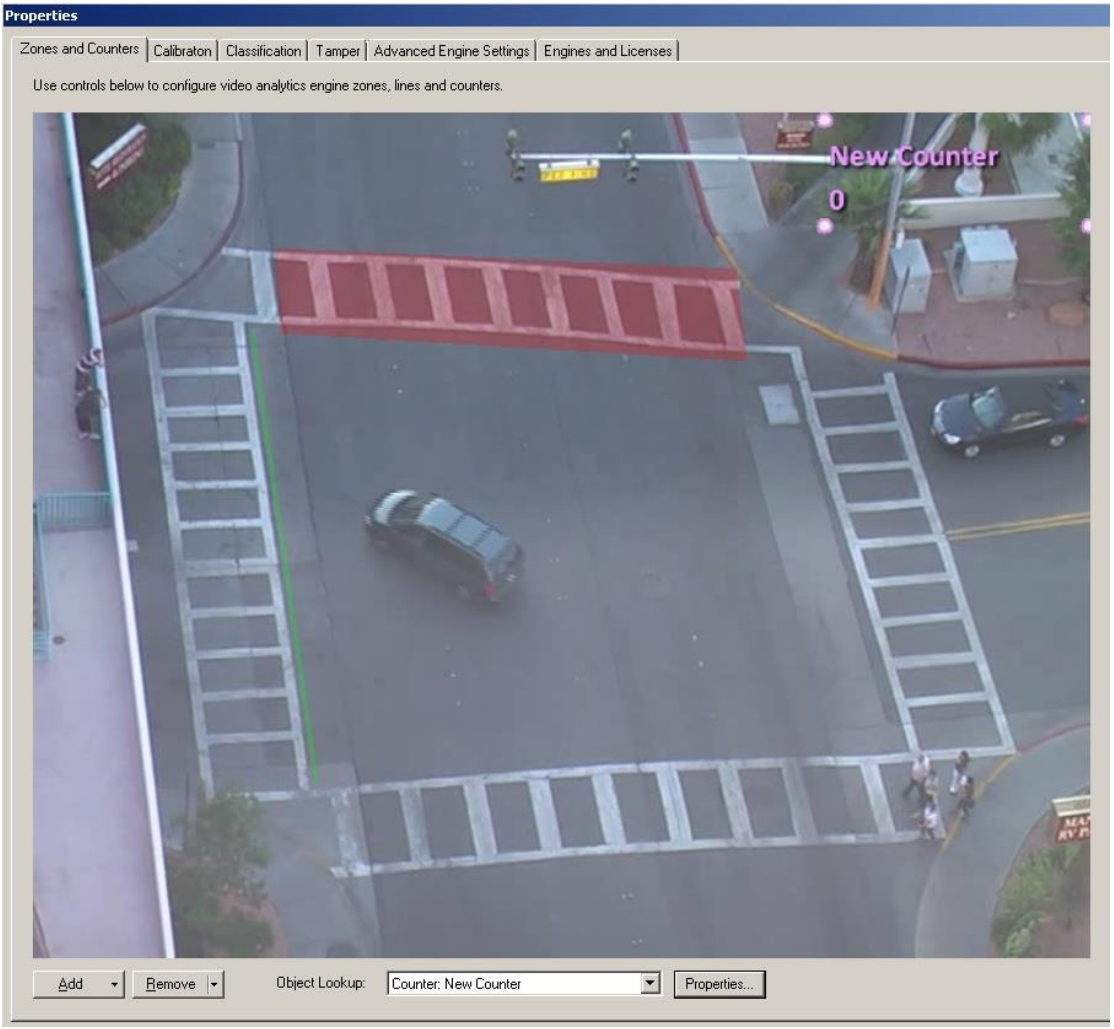
Configuration of Zones and Counters

Configuration of Zones and Counters

In order to create some useful output, it is necessary to configure detection zones and counters. The detection zones and counters are configured by selecting VCA Properties and then the Zones and Counters tab:



This screen has the following functionalities:

- Add zone: Creates a zone.
- Add line: Creates a line.
- Add counter: Creates a counter which will be associated with zone or line.
- Remove: Deletes a selected zone/line/counter.

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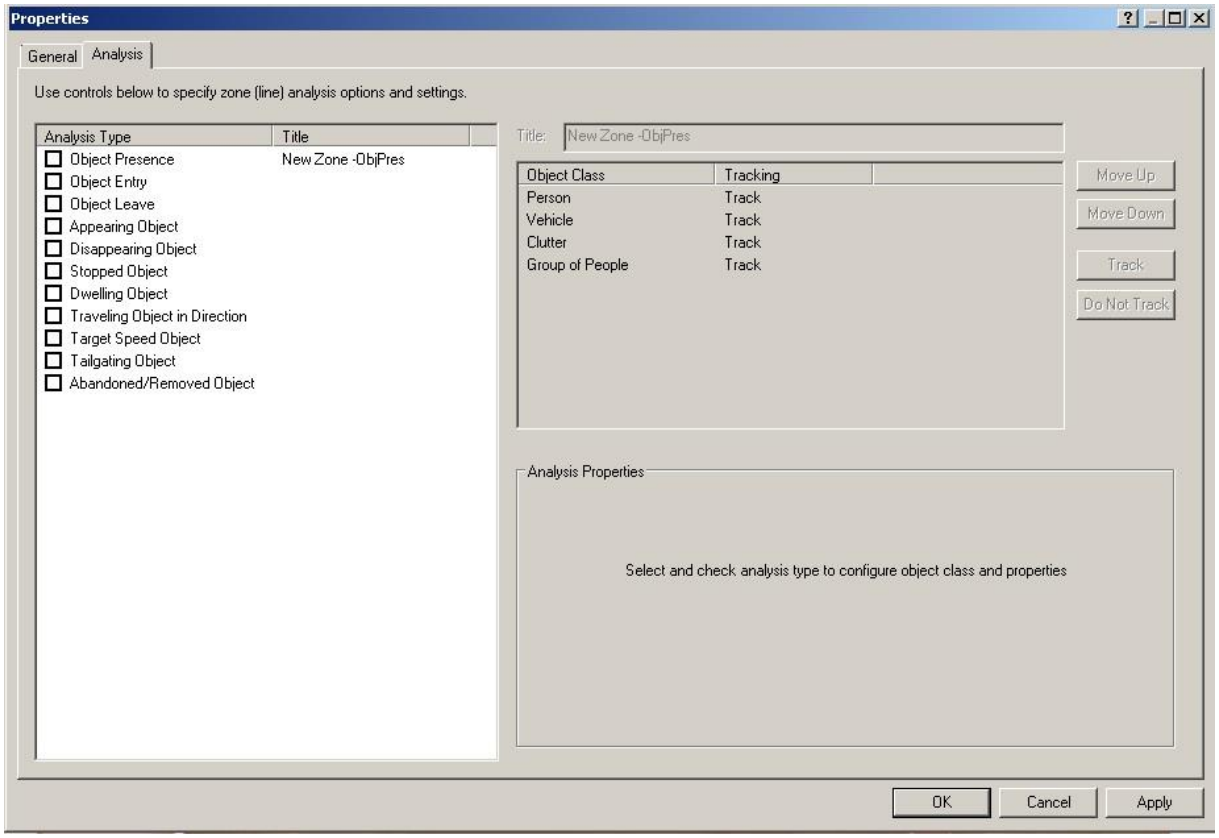
Analysis tab



The Analysis tab allows the user to assign detection rules to detection zones and detection lines. Available rules will depend on the features available and settings applied, and may include the following:

- **Object presence**
- **Object entered**
- **Object exited**
- **Object appeared**
- **Object disappeared**
- **Object stopped**
- **Object dwell**
- **Object direction**
- **Object speed**
- **Object tailgating**
- **Counting line**
- **Abandoned/removed object**

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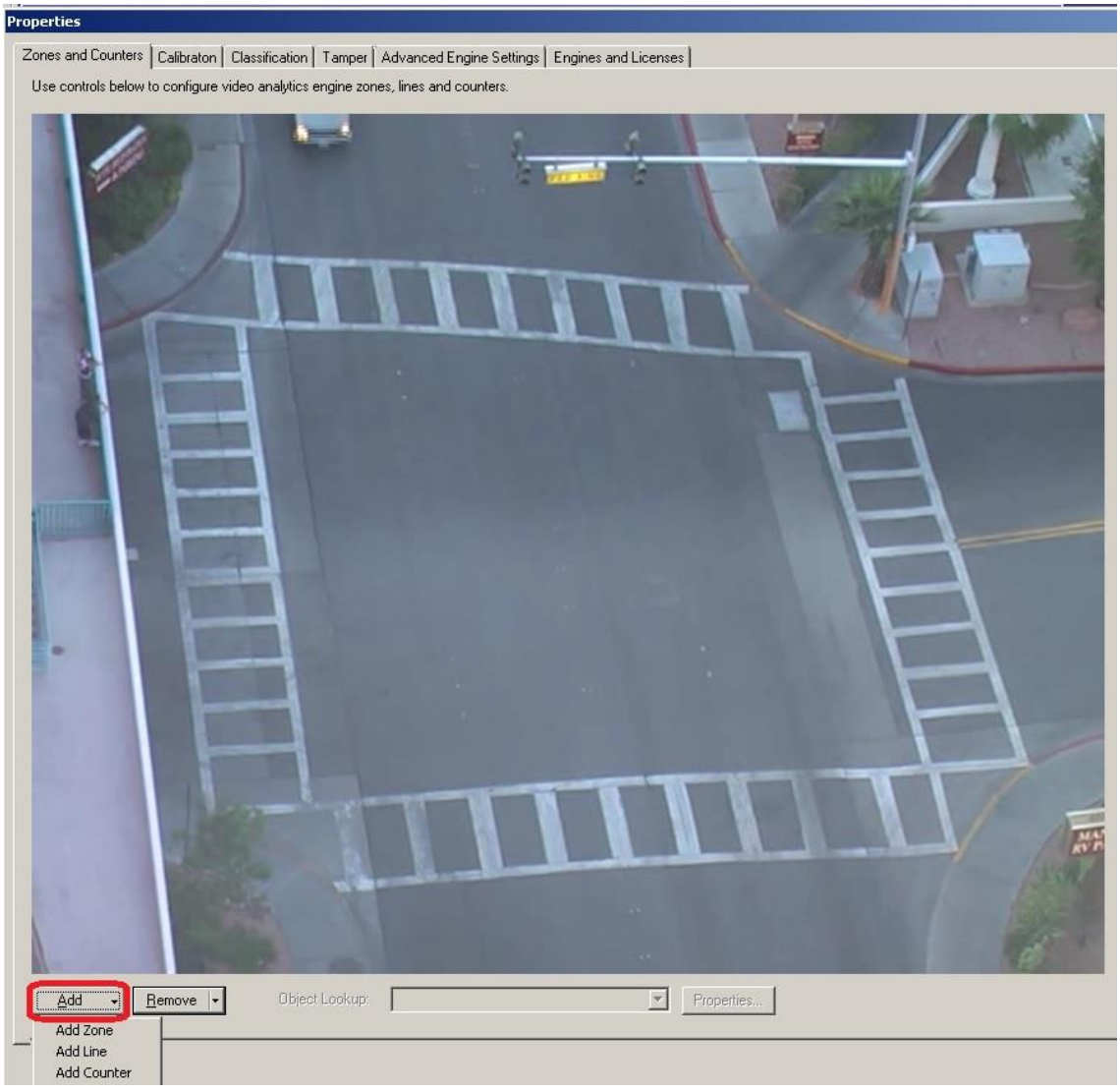
Creating Detection Zones and Lines

In order to detect events of interest, detection zones and lines must be defined. Detection zones define an area of interest. Detection lines are similar to detection zones but they define a perimeter instead of a region.

Creating a Zone or Line

To create a zone or line, select Add button and select “Add Zone/Add Line”.



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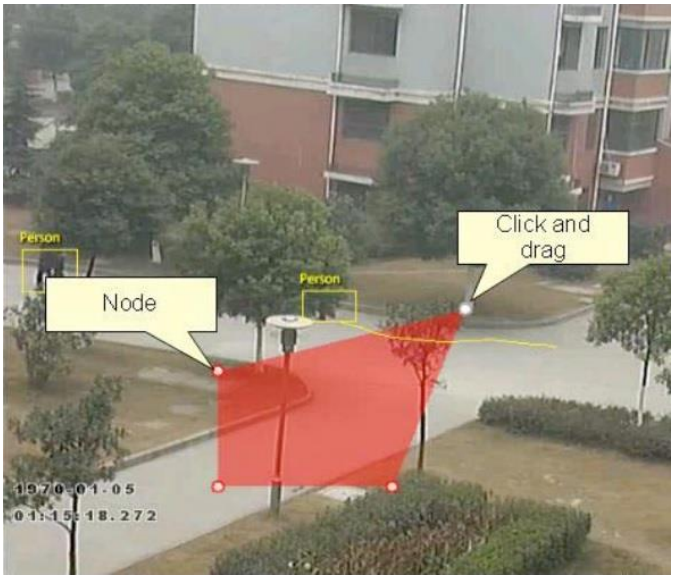
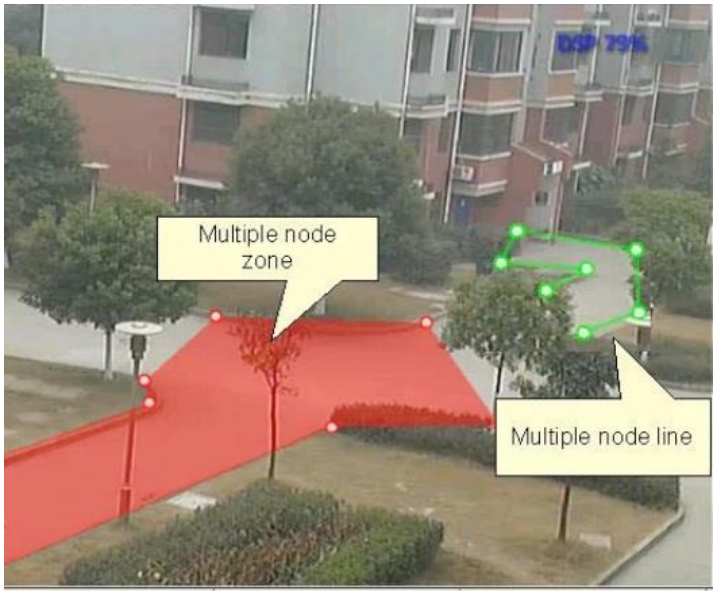
Editing Zones and Lines

Zones and lines can be edited to be any shape or size. Zones and lines are controlled by manipulating "nodes" that represent the zone/line vertices. To change the shape of a zone or line, simply grab a node with the left mouse button and drag it to the desired location:



Adding and Removing Nodes

Zones and lines can be tailored to any scenario by simply adding more nodes to define the shape required. To add a node, simply right click on the zone or line at the point where the new node should be added and select “Add zone point”. Nodes can be deleted by right clicking on the node and selecting “Remove zone point”:



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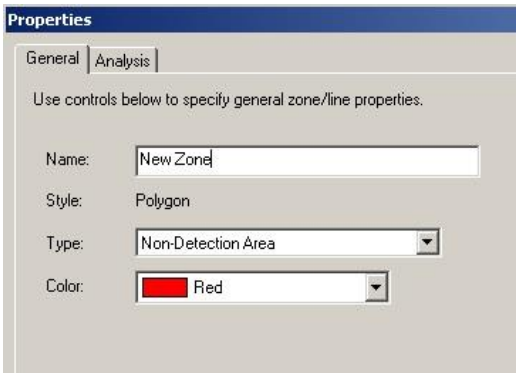
Non Detection Zones

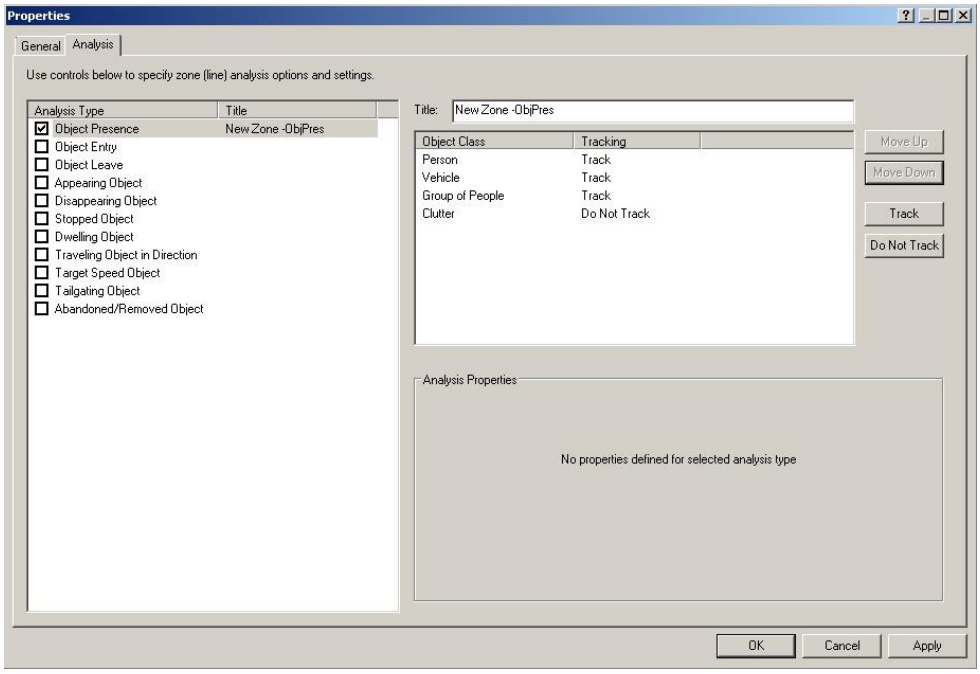
In some situations, especially where the scene is busy, objects tracked in some areas can interfere with detection zones in other areas. For example, on a windy day, moving foliage can generate false alarms that in some situations could be tracked through a detection zone. In order to minimize such issues, it is possible to configure "non-detection" zones, where nothing is detected or tracked.



Detection Rules

Detection Rules

Once some detection zones and/or lines have been configured, it's possible to define some detection rules that apply to the zones/lines. The rules are defined in the Analysis tab:



The Analysis tab is context-sensitive to the zone selected. As different zones/lines are selected, so Analysis tab changes to reflect the rules currently configured on that zone. Defining a rule is a simple matter of checking the box next to the rule required. In all cases, the rules are configured with sensible default values. Of course, these can be customized to suit the detection scenario.

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Object Presence

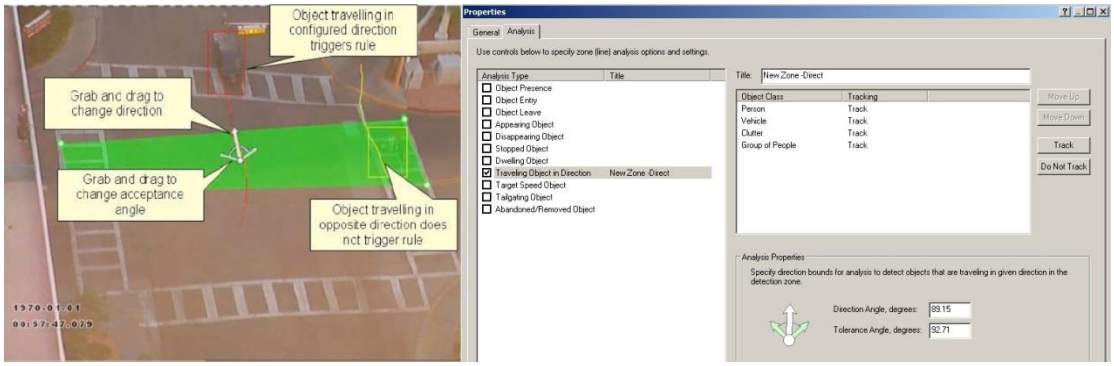
Enable the object presence rule on the selected zone by checking the Object Presence box in the Analysis tab and click apply.

Objects that are present inside a zone or pass through a line will trigger the rule and raise an alarm.

Object Direction

Enable the object direction rule on the selected zone by checking the Traveling Object in Direction box in the Analysis tab. Adjust the direction and tolerance angle to suit the detection scenario.

Objects that travel in the configured direction (within the limits of the tolerance angle) through a zone or over a line trigger the rule and raise an alarm.



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Object Enter and Exit

Enable the object entry and leave detection by checking the corresponding check boxes in the Analysis tab and click apply.

An object entered alarm is raised when an object crosses from the outside to the inside of a detection zone. Conversely, an object exited alarm is raised when an object crosses from the inside to the outside of a detection zone:

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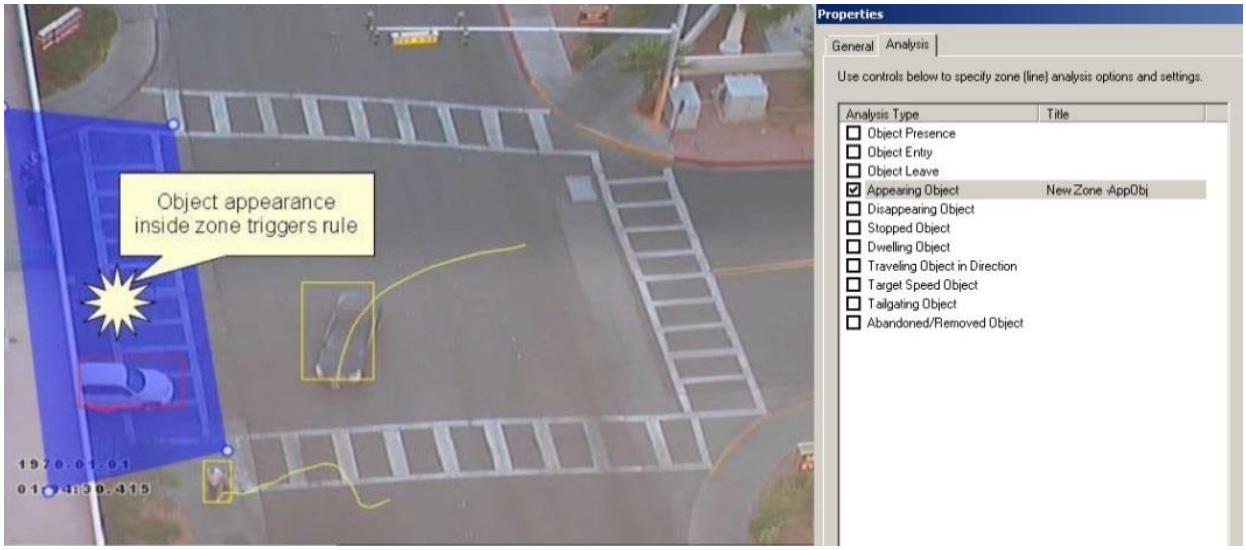
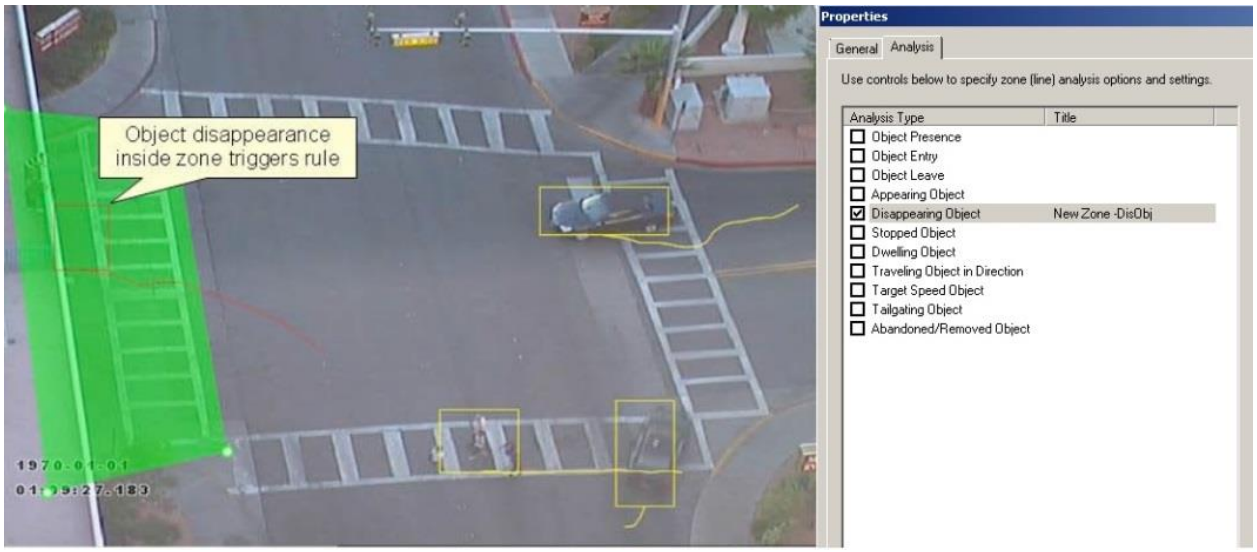
Object Appear and Disappear

Enable the object appear and disappear detection by checking the corresponding check boxes in the Analysis tab and click apply.

An object appearing alarm is raised when an object appears inside a detection zone. Note that this is different from object entered detection since the object must be initially detected inside the zone without entering, e.g. people appearing in a doorway, or cars appearing from an underground car park.

Conversely an object disappearing alarm is raised when an object disappears inside a detection zone. Again, this is different from object exit detection since the object must be tracked into the zone and then disappear without exiting the zone.





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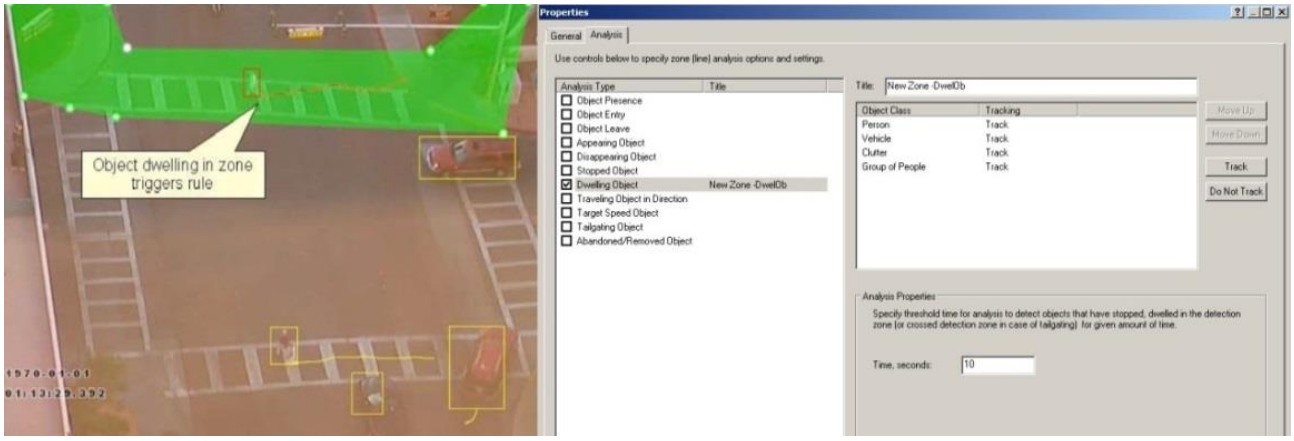
Object Dwell

Enable the object dwelling rule on the selected zone by checking the Dwelling Object box in the Analysis tab and click apply.

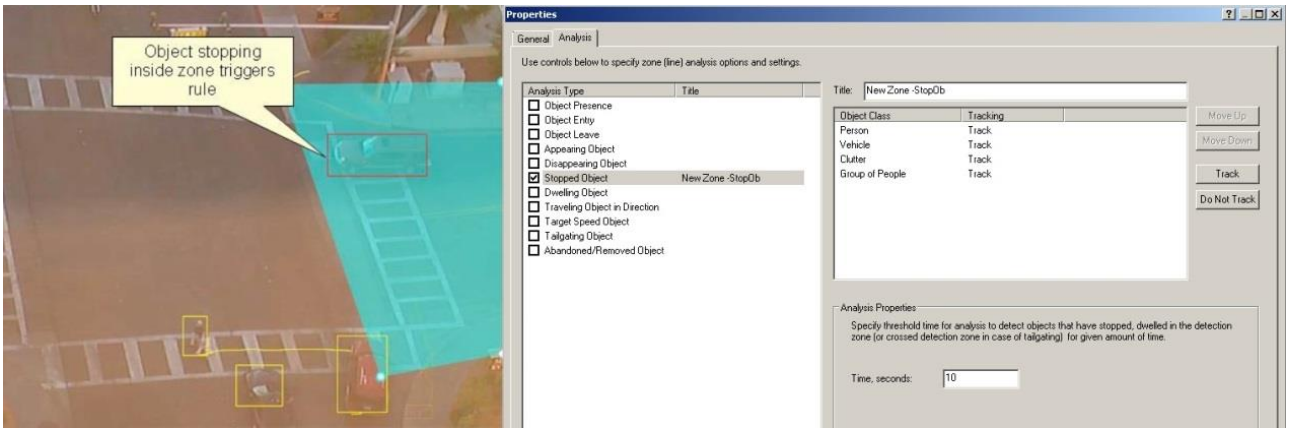
Objects that dwell inside a zone for longer than the defined amount of time will trigger the rule and raise an alarm.



Object Stopped

Enable the object stopped rule on the selected zone by checking the Stopped Object box in the Analysis tab and click apply.

Objects that are stopped inside a zone for longer than the defined amount of time will trigger the rule and raise an alarm.



The stopped time can be also configured in Analysis properties.

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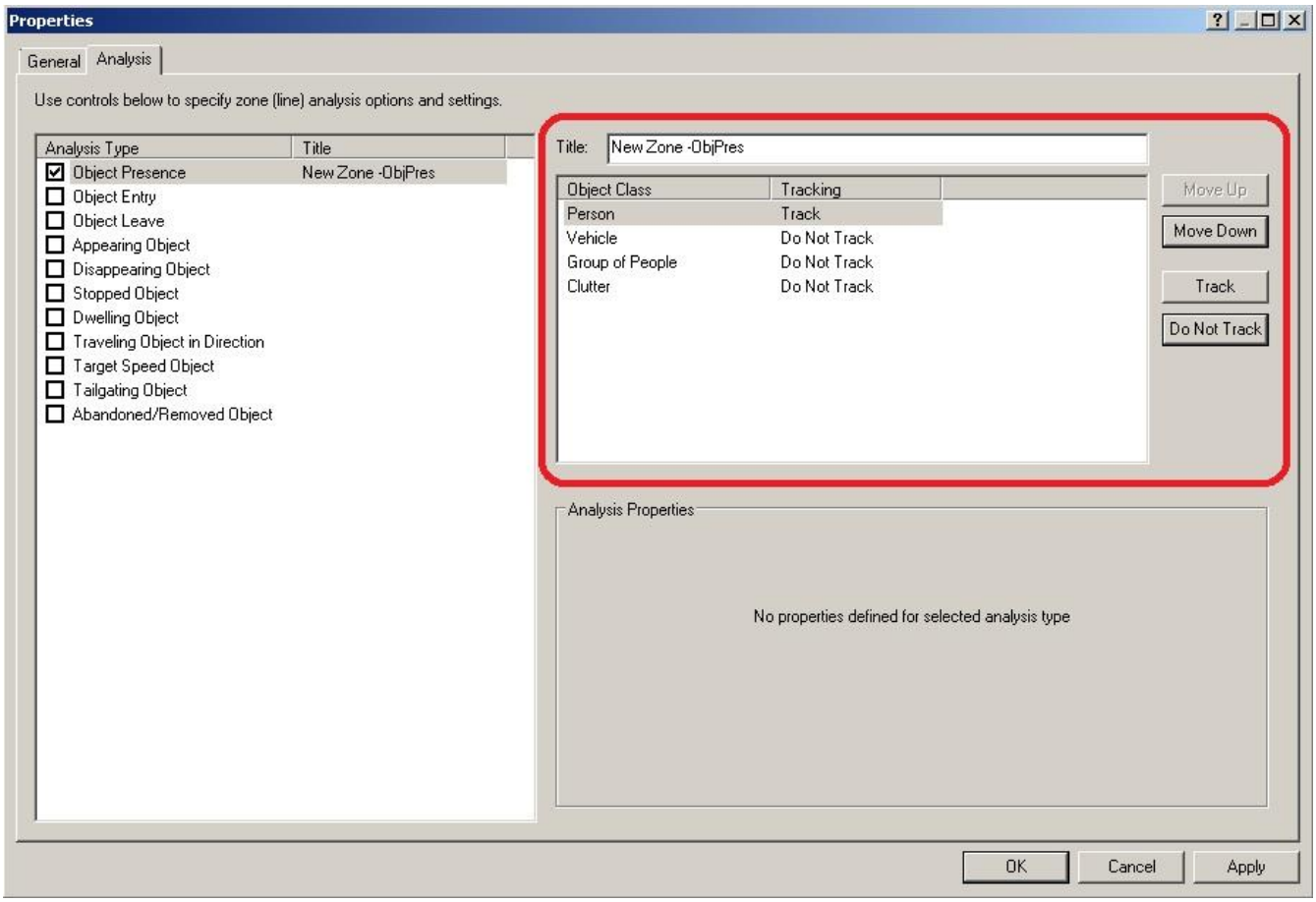
Object Class

Once the camera has been calibrated, it's possible to include or exclude specific object types in the detection rules.



Select the object type to track or do not track.

In this example, the rule has been configured to include detection of person only.

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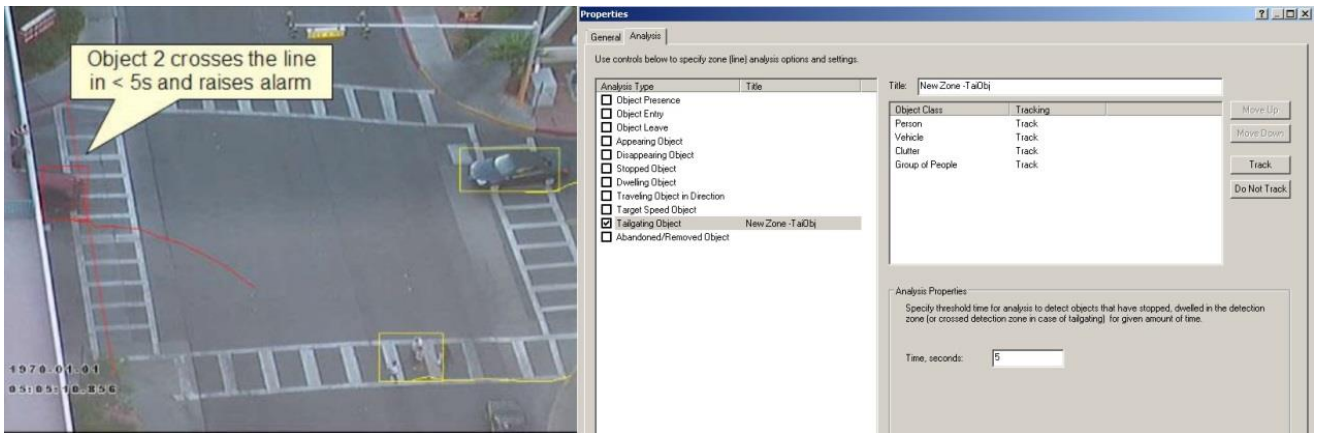
Object Tailgating

Enable the object tailgating rule on the selected zone by checking the Tailgating Object box in the Analysis tab. Adjust the time threshold to set the minimum allowable time between successive object detections.

Object tailgating is defined as an object crossing a line or zone within a certain time after an object has already crossed the line or zone. If an object crosses a line or zone, and another object crosses the same line or zone within the specified time window, the Object Tailgating filter will be triggered.

In this example, Object 1 is about to cross a detection line. Another object (Object 2) is following closely behind. The tailgating detection threshold is set to 5 seconds. That is, any object crossing the line within 5s of an object having already crossed the line will trigger the Object Tailgating filter.

Object 2 crosses the line within 5 seconds of Object 1. This triggers the Object Tailgating filter.



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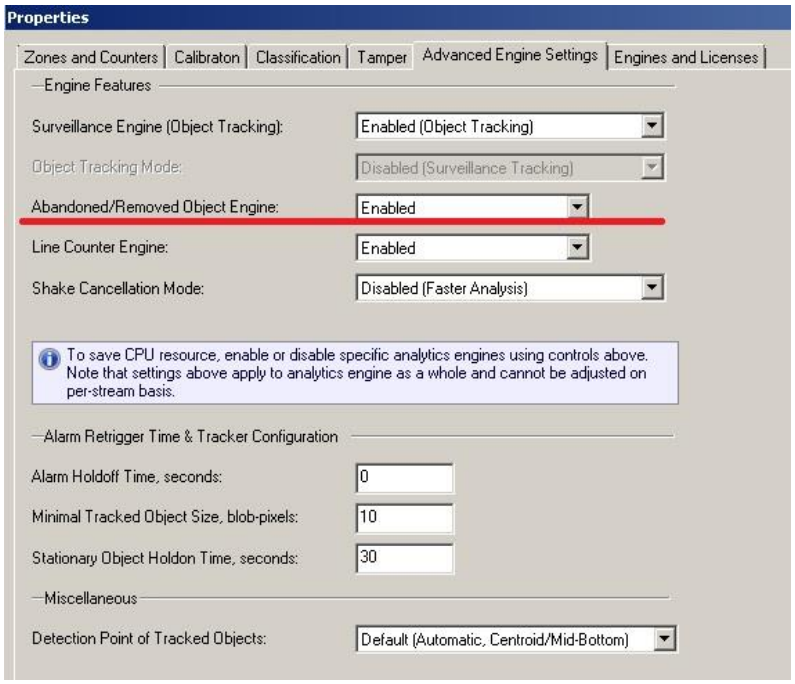
Abandoned and Removed Object

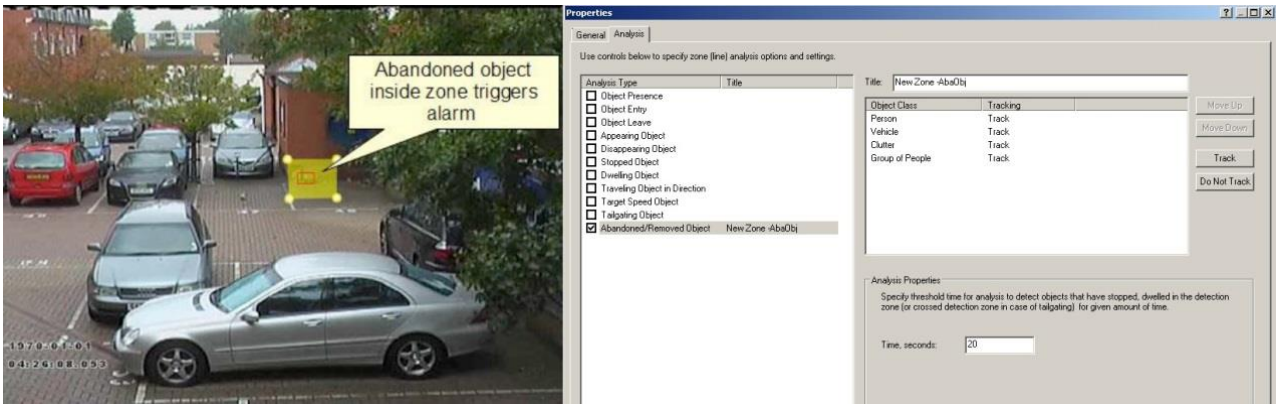
Ganz Analytics can be configured to generate an alert highlighting an abandoned or removed object. Suspicious objects can be detected when carried into the scene and planted by a person as well as when dropped or thrown into the scene.

Ensure that abandoned/removed object engine is enabled by checking the "Abandoned/Removed Object Engine" drop box in the Advanced Engine Settings tab.



NOTE: The algorithm used for abandoned and removed object detection is the same in each case: it cannot differentiate between abandoned or removed objects. This is a fundamental limitation of the algorithm and arises because it just analyses how blocks of pixels change with respect to a background model that is constructed over time. When an object is inserted into the background (abandoned) it looks the same to the algorithm as when an object is removed from the background.

Enable the abandoned/removed object rule on the selected zone by checking the Abandoned/Removed Object box in the Analysis tab. An object that is left inside a zone for longer than the configured time period will trigger the rule and raise an alarm.



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The following figure illustrates the abandoned/removed object detection rule detecting a removed bicycle.

Stationary Object Hold-on Time

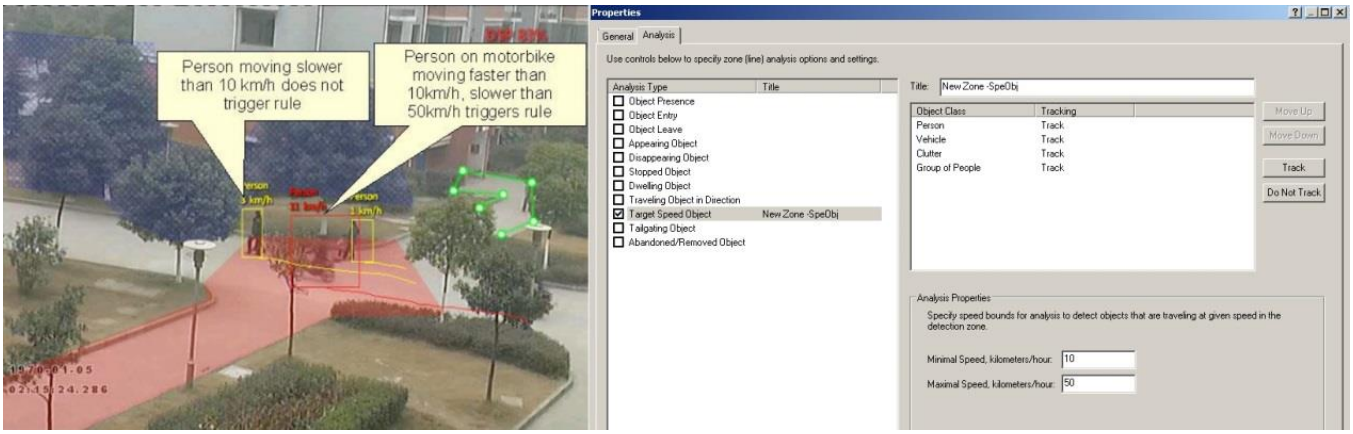
The stationary object hold-on time is the time which the tracker will keep tracking an object once it has been detected as stationary or abandoned/removed. After an abandoned/removed object has been detected, the object will continue to be tracked for the time configured determined by the stationary object hold-on time. The default value is 30 seconds, but this can be changed in the Advanced Engine Settings tab.

Object Speed

Enable the object speed rule on the selected zone by checking the Target Speed Object Filter box in the Analysis tab. Adjust the minimal and maximal speed limits to suit the detection scenario.

Objects that travel within the bounds of the configured speeds, through a zone or over a line trigger the rule and raise an alarm.

Note that the camera must be calibrated to operate correctly.



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Counting Line

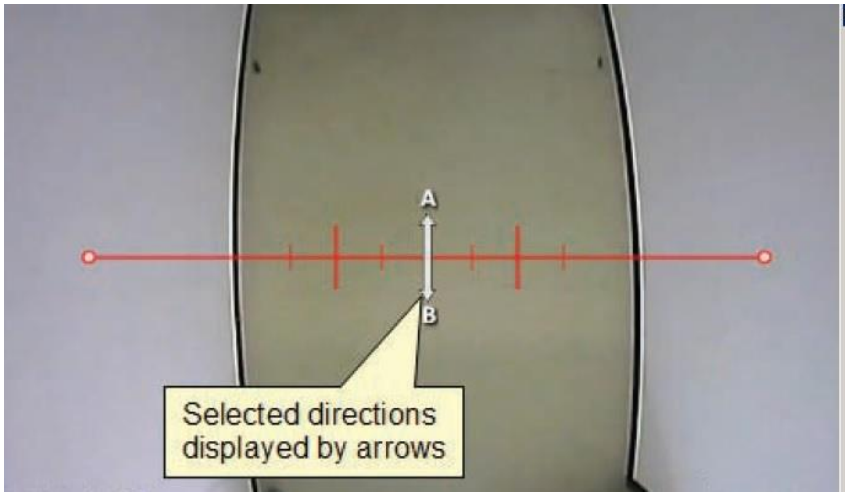
A counting line (Object Crossing Line A/B) is a detection filter optimized for bi-directional object counting (e.g. people or vehicles) in busier detection scenarios. Examples of such applications may include:

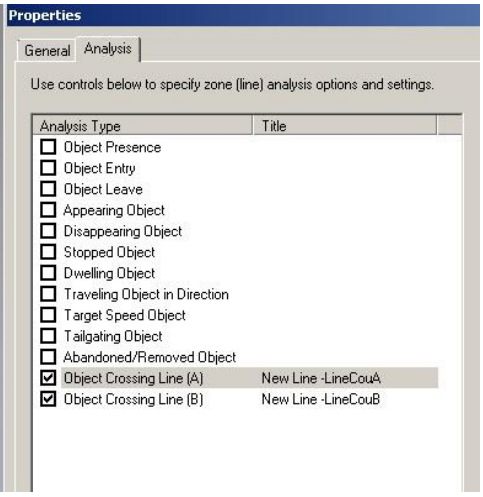
- People counting with overhead cameras in a retail environment.
- Vehicle counting with overhead cameras on public highways.

In some scenes such as entrance with camera over-head installed, the counting line typically will generate a higher accuracy count than using the ordinary counters and lines.

Enabling the Counting Line

Enable the counting line filter on a detection line in the desired direction(s) by checking the "Object Crossing Line A/B" box in the Analysis tab. An event is generated every time an object crosses the line in the selected direction. If multiple objects cross the line together, multiple corresponding events are generated. The events generated by the counting line can be tied to counters in the normal manner.





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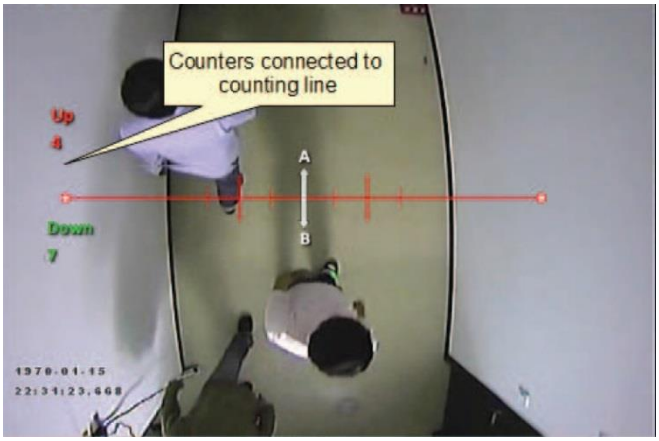
Assigning Counters to Counting Lines

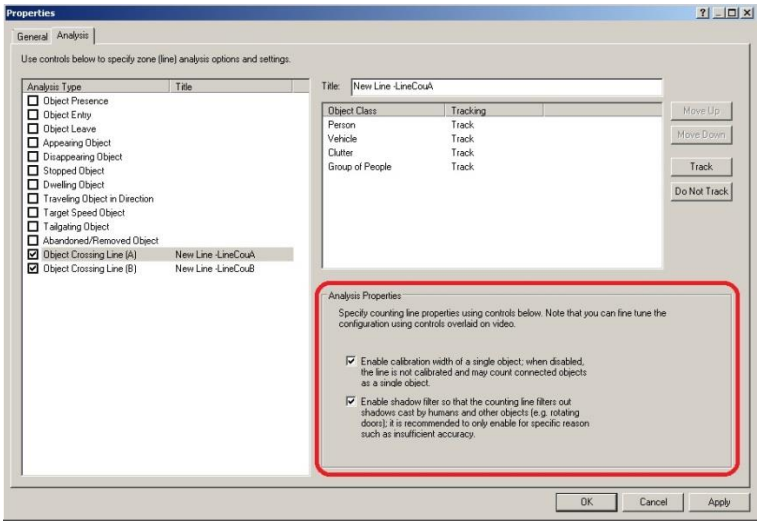
A counting line by itself simply generates events when an object to be counted is detected. In order to actually count the events, counters (one for each direction) can be created and configured to count the events generated by the line. To create counters, see the Counters topic.



Calibrating the Counting Line

In order to generate accurate counts, the counting line requires calibration. This cannot be performed at a general level for the whole scene using the 3D calibration tool. This is because the counting line is not always placed on the ground plane: it may be placed at any orientation at any location in the scene. For example, a counting line could be configured vertically with a side-on camera view.

Instead of the 3D calibration tool, the counting line has its own calibration setting. Two bars equidistant from the centre of the line represent the width of the expected object. This allows the counting line to reject noise and also count multiple objects.



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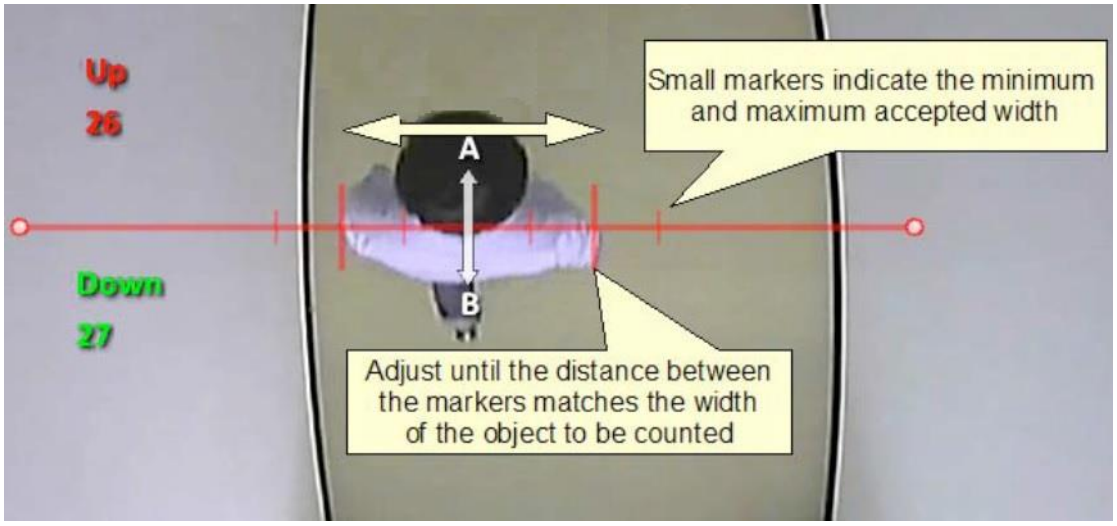
To calibrate the counting line:

- Select the counting line with the mouse.
- Check the "Enable Calibration" box under the “Object Crossing Line A/B” rule in the Analysis properties.
- Use the mouse to drag the calibration markers to adjust the distance between the calibration markers until the distance is approximately the size of the objects to be counted.
- The small markers on either side of the big markers indicate the minimum and maximum width which is counted as a single object.
- Apply the settings.



Shadow Filter

The counting line features a shadow filter which is designed to remove the effects of object shadows affecting the counting algorithm. Shadows can cause inaccurate counting results by making an object appear larger than its true size or by joining two or more objects together. If shadows are causing inaccurate counting, the shadow filter should be enabled by selecting the "Enable Shadow Filter" check box for the line. It is recommended that the shadow filter only be enabled when shadows are present because the algorithm can mistake certain parts of an object for shadows and this may lead to worse counting results.

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Counters

Counters

Ganz VCA also supports object counting. Any combination of detection zones or lines can be assigned to a counter. Counters can be configured to perform any combination of incremental, decremental or occupancy counting. Counter configuration is managed in a similar way to the zone configuration.

Topics in this section:

- Creating Counters
- Assigning Rules to Counters

Creating Counters

To create a counter simply select “Add Counter” in Zones and Counters tab.

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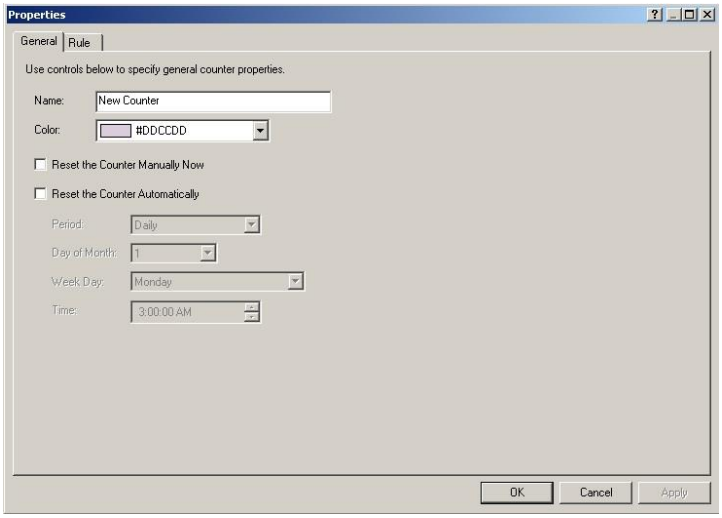
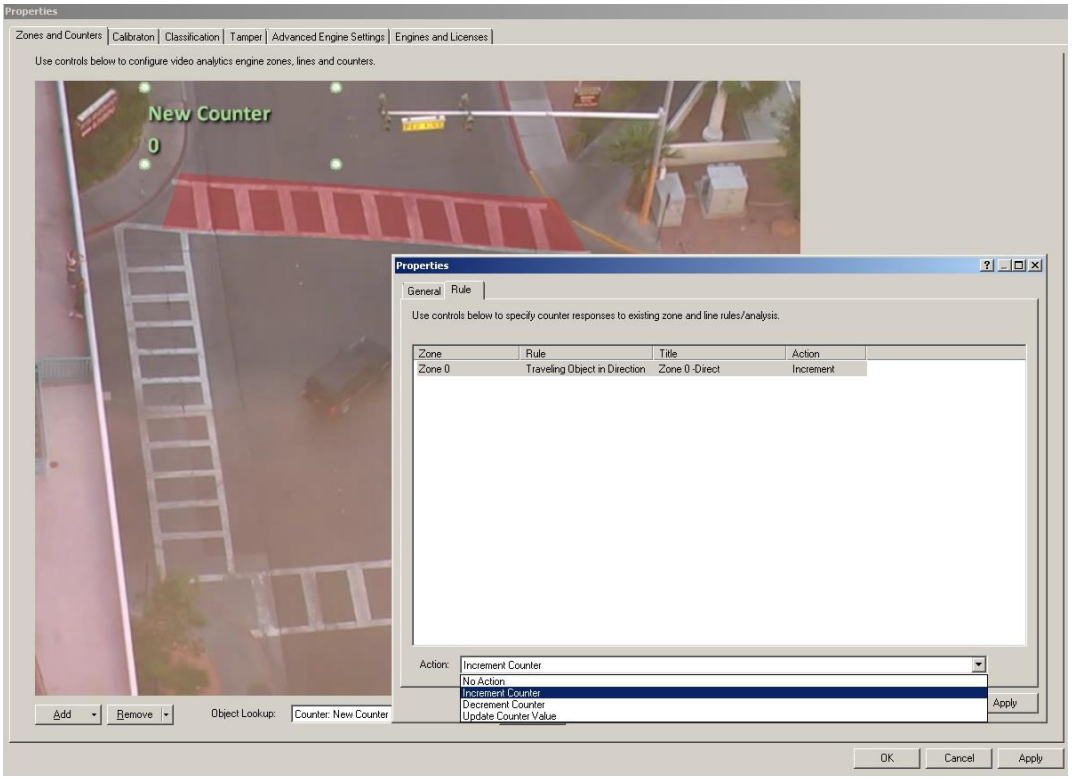
The counter name and color can be changed in Counter Properties on "General" tab.



Assigning Rules to Counters

Counters count triggers generated by rule violations. For example, if it is required to count the number of objects entering a zone, a zone must initially be configured to raise an alarm every time an object enters it. The zone can then be assigned to a counter and the counter will count the objects according to the type of counting required (increment, decrement, update value).



In this example the red zone is configured to trigger when object travelling in the north direction are detected. The counter has been configured to increment the count whenever the zone (Zone 0) is triggered.

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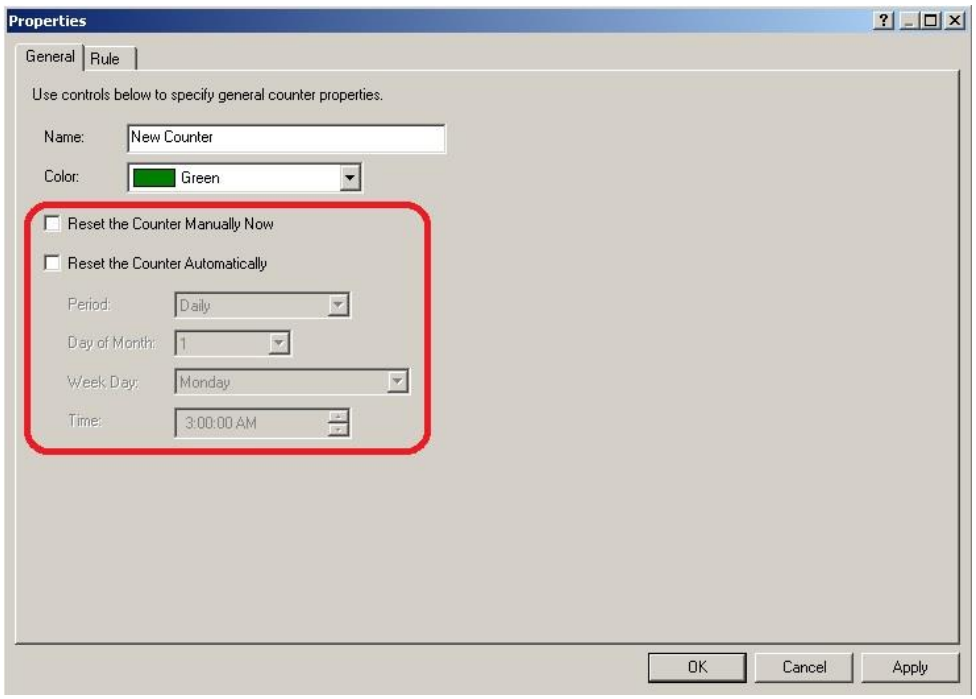
Increment Counter
When a zone is assigned to an incremental counter, the count will increment by 1 every time the zone is triggered.

Decrement Counter
When a zone is assigned to a decremented counter, the count will decrement by 1 every time the zone is triggered.

Update Value Counter
When a zone is assigned to an update value counter, the counter displays the number of active triggers in the zone. E.g. if there are 2 objects in the zone that triggered the detection rule, then the count will display 2.

Counter Reset

Counter reset manually and automatically



To reset counter manually select checkbox “Reset the Counter Manually Now”.

To reset counter automatically, select checkbox “Reset the Counter Automatically” and set the date and time of reset.

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Camera Calibration

Camera Calibration

Camera calibration is required in order for the Ganz VCA engine to classify objects into different object classes. Once the camera has been calibrated, the engine can infer real-world object properties such as speed, height and area and classify objects accordingly.

Camera Calibration Topics

- Calibration Page Elements
- Calibrating a Camera
- Vertical Field of View
- Measurement Units

Calibration Page Elements

The following describes the purpose of each element of the calibration page. To get started calibrating straight away, see the Calibrating a Camera topic.

3D Graphics Overlay

During the calibration process, the features in the video image need to be matched with a 3D graphics overlay. The 3D graphics overlay consists of a green grid that represents the ground plane. Placed on the ground plane are a number of 3D mimics that represent the dimensions of a person with the current calibration parameters. The calibration mimics are used for verifying the size of a person in the scene.

Mouse controls

The calibration parameters can be adjusted as follows:

- Click and drag the ground plane to change the tilt angle.
- Use the mouse wheel to adjust the camera height.

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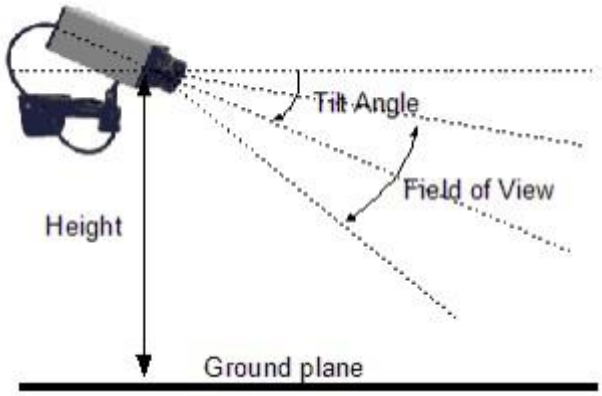
Calibrating a Camera

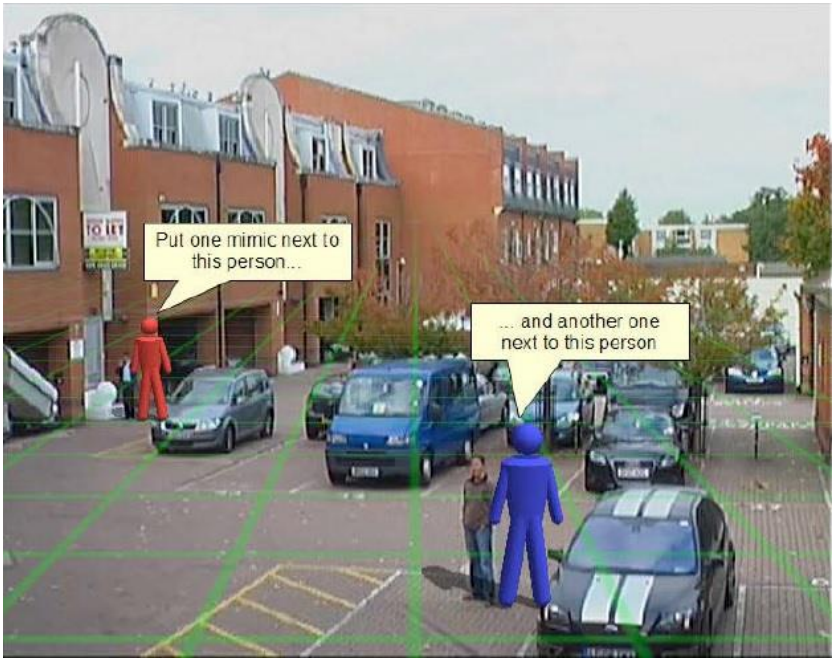
Calibrating a camera is necessary in order to estimate object parameters such as height, area, speed and classification. If you know the height, tilt angle and vertical field of view corresponding to your installation, you can simply type the parameters in the appropriate boxes and apply the changes.



If however, you do not know, or are unable to find out the camera parameters, this topic provides a step-by-step guide to calibrating a camera.

Step 1: Find some people in the scene

Find some people, or some people-sized objects in the scene. Try to find a person near the camera, and a person further away from the camera. Place the mimics on top of or near the people. Enter in the known height or estimated height.



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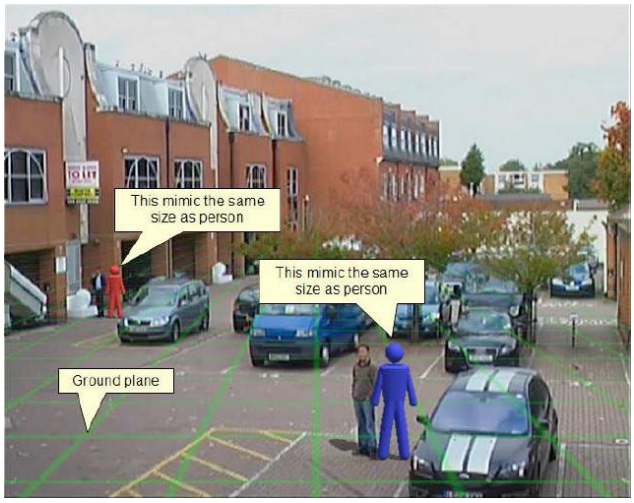
Step 2: Adjust tilt angle and camera height

Now, adjust the camera tilt angle and vertical field of view until both mimics are approximately the same size as a real person at that position in the scene. If an estimated height is entered then adjust this along with the other two parameters.

Click and drag the ground plane to change the tilt angle, use the mouse wheel to adjust the camera height and enter the value in Vertical Field of View edit box to change the vertical field of view.

Apply the changes:



Once the changes have been applied, the Calibration Status reflects whether the operation was successful, and if so, in which mode the camera is calibrated.

Step 3: Verify the setup

Once you are happy that the scene is correctly calibrated, verify the settings by dragging the mimics around and comparing them to other people or people-sized objects in the scene.

The more locations in the scene where the calibration is verified, the more accurate the calibration will be.

The 3 calibration parameters can be fine-tuned in the same way as detailed in Step 2.

Once the settings have been successfully applied, objects in the scene are annotated with height, area, speed and classification. To change the measurement units between Metric and Imperial, please refer to the Measurement Units Topic.

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Vertical Field of View

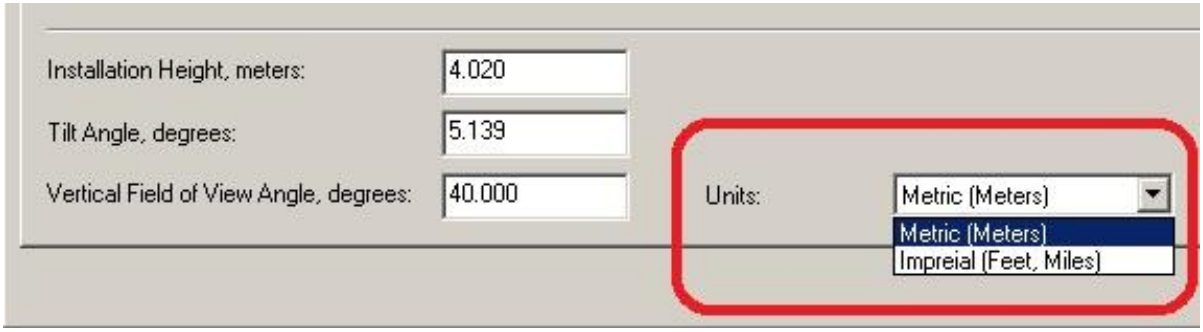
The vertical field of view is required when calibrating a camera. If you know the vertical field of view of the camera it can be entered directly. If however, you don't know the vertical field of view, it can be determined from the following table, given the vertical image dimension and its focal length:

										Focal length (mm)									
Image Format (in)	Vertical Image Dimension (mm)	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	4	6	10	15	20	30	40	50
1/4"	2.4	100.39	90.00	81.20	73.74	67.38	61.93	57.22	53.13	49.55	46.40	43.60	33.40	22.62	13.69	9.15	6.87	4.58	3.44	2.75
1/3"	3.6	121.89	112.62	104.25	96.73	90.00	83.97	78.58	73.74	69.39	65.47	61.93	48.46	33.40	20.41	13.69	10.29	6.87	5.15	4.12
1/1.8"	5.32	138.79	131.44	124.48	117.95	111.83	106.12	100.81	95.88	91.31	87.06	83.12	67.25	47.82	29.79	20.11	15.15	10.13	7.61	6.09

If you are unable to determine the vertical field of view for your camera from the above table, leave the field of view at its default setting, 40°.

Measurement Units

The height, area and speed annotation can be displayed in metric or imperial units. By default the system displays metric units. To change the measurement units, select the “Units” drop box in “Calibration” tab and apply the changes.



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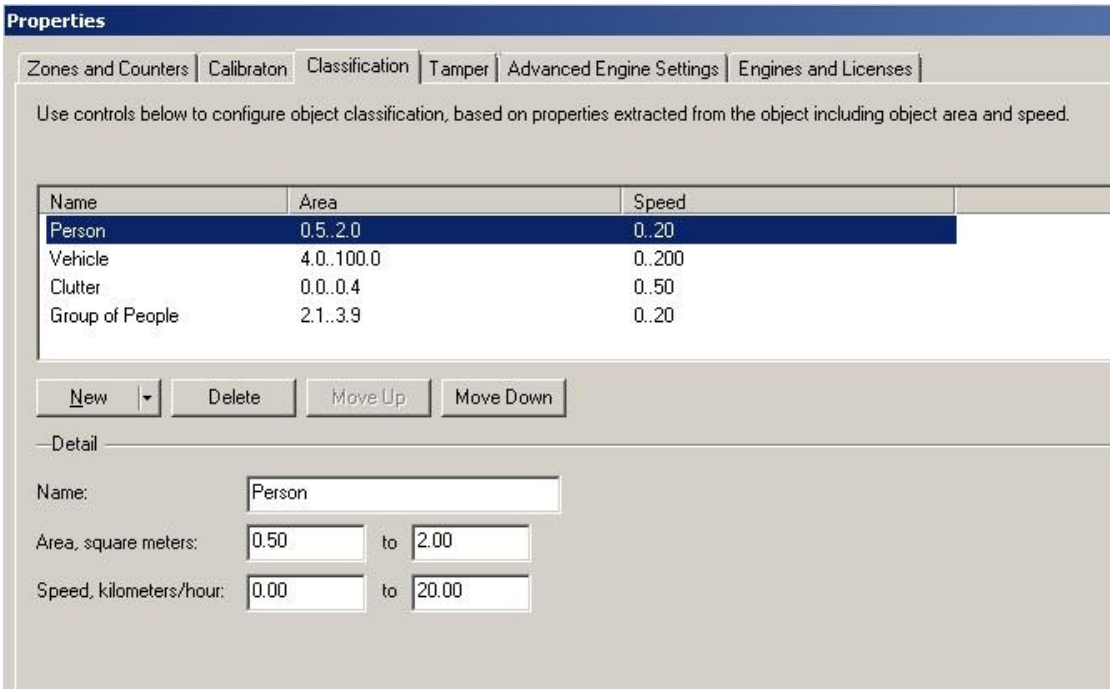
Object Classification

Object Classification

Ganz VCA can perform object classification once the camera has been calibrated. The object classification is based on properties extracted from the object including object area and speed. Ganz VCA comes pre-loaded with the most common object classes, and in most cases these will not need to be modified.

In some situations it might be desirable to change the classification parameters, or add new object classes.

To adjust the object class settings, select the Classification tab and the object class to modify:



Adjust the minimum and maximum object speed and area, and apply the changes.

Objects that do not fit into any class are labelled as "Unclassified".

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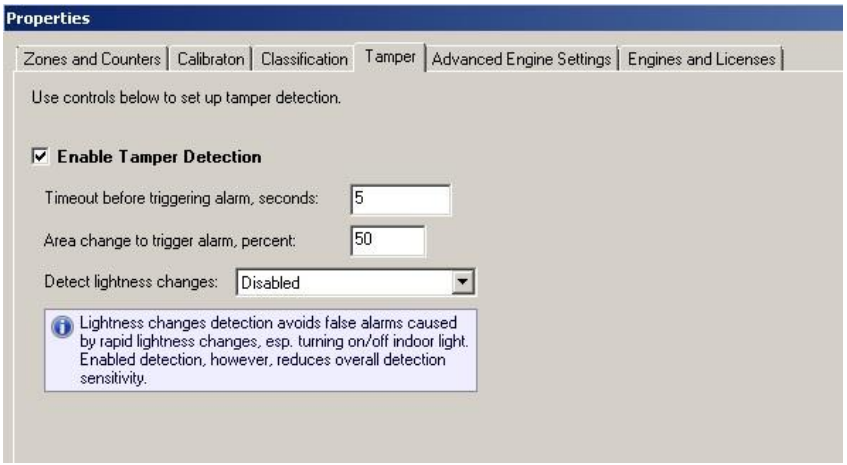
Tamper Detection

Tamper Detection

The Tamper Detection module is intended to detect camera tampering events such as bagging, de-focusing, moving the camera, etc. This is achieved by detecting large persistent changes in the image.



Once enough of the image has changed and remained so for a certain length of time, a tamper alarm is triggered.

Tamper Detection Settings

In the tamper detection settings it is possible to change the thresholds for the area of the image which must be changed and the length of time it must be changed for before the alarm is triggered.

- **Timeout before triggering alarm**: The length of time that the image must be persistently changed before the alarm is triggered.
- **Area change to trigger alarm**: Percentage area of the image which must be changed for tampering to be triggered.

If false alarms are a problem the duration and/or area should be increased so that large transient changes such as a close object temporarily obscuring the camera do not cause false alarms.

Detect lightness changes

Large fast changes to the image lighting such as switching on/off indoor lighting can cause false tamper alarms. Enable this option if this is likely to be a problem in the area where the camera is installed. However, this option will reduce sensitivity to genuine alarms so it is not recommended if fast light changes are not likely to be a problem.

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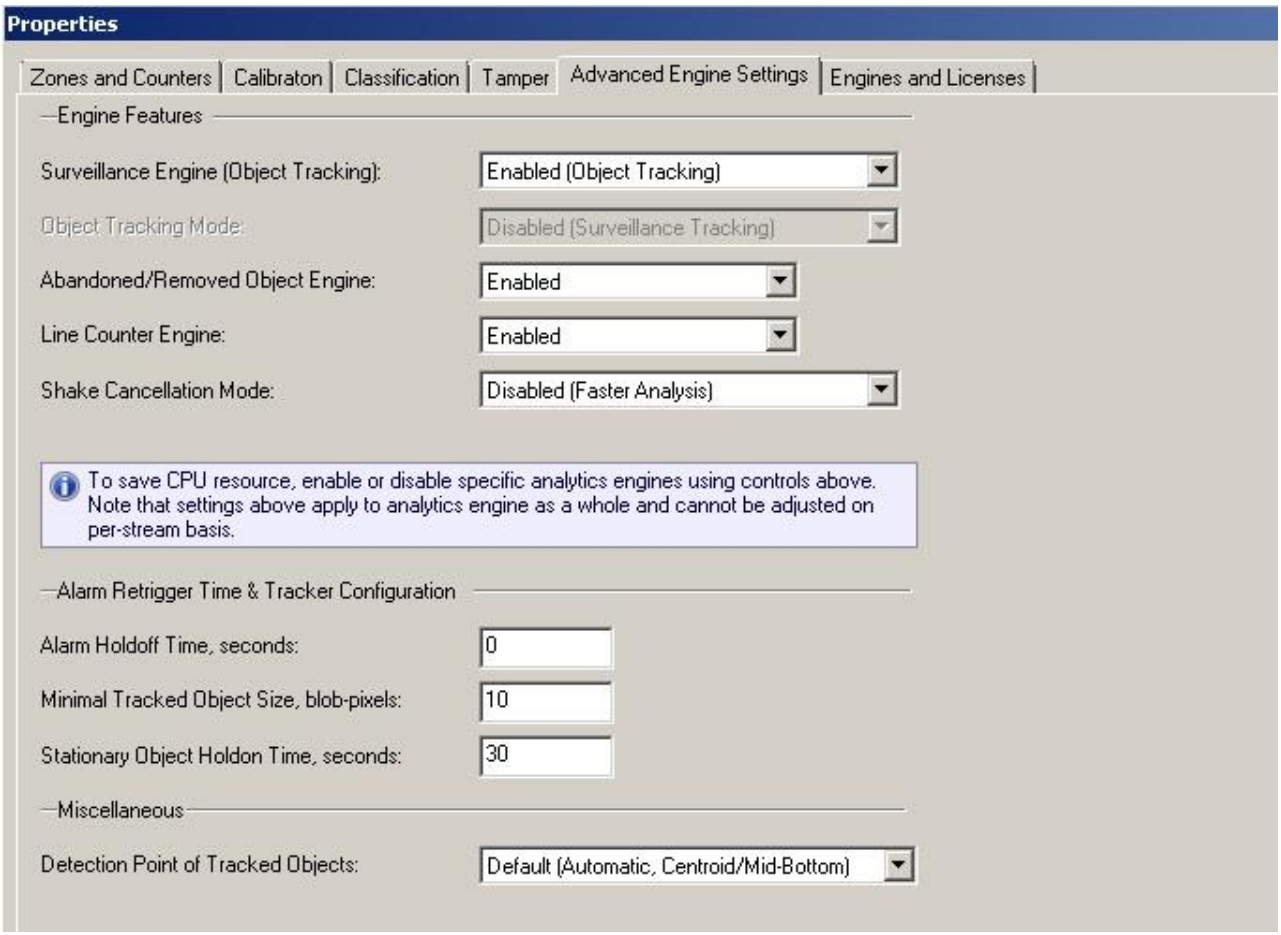
Advanced VCA Settings

In most installations, the default Ganz VCA configuration will suffice. However, in some cases, better performance can be achieved with modified parameters. The Advanced Engine Settings tab allows configuration of the advanced VCA parameters.



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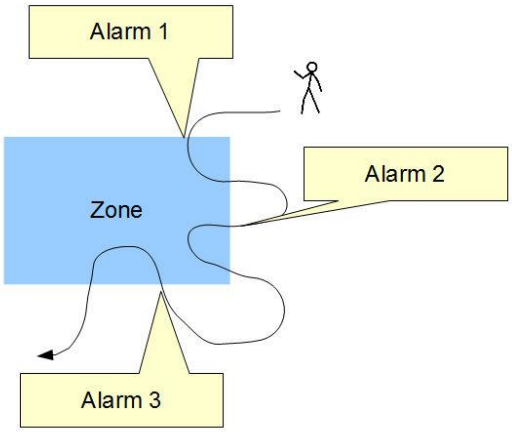
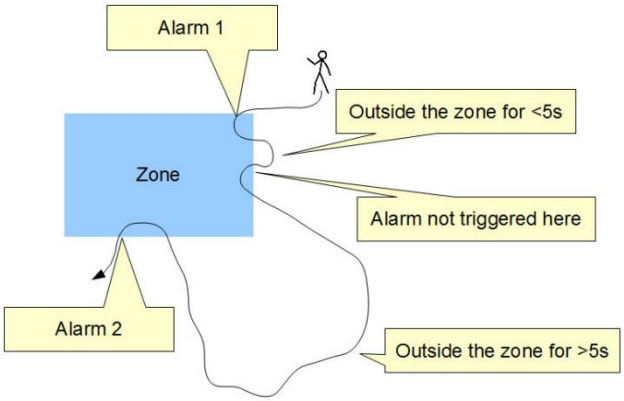
Alarm Holdoff Time

The Alarm Holdoff Time defines the time between the successive re-triggering of an alarm generated by the same object triggering the same rule.

To explain this concept, consider the following diagram where no Alarm Holdoff Time is configured:



In this detection scenario, the person enters the zone 3 times. At each point an alarm is raised, resulting in a total of 3 alarms. With the Alarm Hold off Time configured, it's possible to prevent re-triggering of the same rule for the same object within the configured time period. Consider the same scenario, but with an Alarm Hold off Time of 5 seconds configured:



In this case, an alarm is not raised when the person enters the zone for the second time, because the time between the occurrences of the last alarm of the same type for the object is less than the Alarm Hold off Time. When the person re-enters the zone for a third time, the elapsed time since the previous alarm of the same type for that object is greater than the Alarm Hold off time and a new alarm is generated.

In essence, the Alarm Hold off Time can be configured to prevent multiple alarms being generated because an object is loitering on the edge of a zone. Without Alarm Hold off Time configured, this scenario would cause so-called "Alarm chatter".

Stationary Object Hold-on Time

The Stationary Object Hold-on Time defines the amount of time that an object will be tracked by the engine once it becomes stationary. Since objects which become stationary must be "merged" into the scene after some finite time, the tracking engine will forget about objects that have become stationary after the Stationary Object Hold-on Time. The default setting is 30 seconds.

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Tracking Options

Minimum Tracked Object Size

The Minimum Tracked Object Size defines the size of the smallest object that will be considered for tracking, in pixels. Normally there is no need to modify this value. Decreasing it will allow the engine to track smaller objects at the expense of noise immunity.

Detection Point of Tracked objects

For every tracked object, there is a point that we use to determine this object's position, and decide whether this object triggers a rule. We call this point as detection point. There are 3 modes to define the detection point relative to the object: Default, Centroid and Mid-bottom.

- Default - When user chooses this mode, Ganz VCA will automatically set the position of detection point. It chooses centroid if the camera is calibrated overhead, or mid-bottom if the camera is calibrated side-on or un-calibrated.
- Centroid - If user chooses this mode, Ganz VCA will force the detection point to be centroid.
- Mid-bottom - If user chooses this mode, Ganz VCA will force the detection point to be mid-bottom.

The first picture shows the centroid mode, and the second shows the Mid-bottom mode.

Object Tracking

Enable/disable the object tracking engine. When enabled, there is Surveillance Tracking mode of object tracking available.

Surveillance Tracking

Optimized for intrusion detection and general purpose outdoor object detection and tracking. When objects are in close proximity to each other they are more likely to be tracked as a single object than separate entities.

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Abandoned/Removed Object Engine

Enable/disable abandoned/removed object detection. When checked, a background process to detect abandoned and removed objects is enabled.

Line Counter Engine

Enable/disable the counting line functionality.

Shake Cancellation Mode

The camera shake cancellation function is used to improve the Ganz VCA performance with cameras that are prone to shake. By default, camera shake cancellation is disabled. If your installation suffers from camera shake problems, enable this function to improve the Ganz VCA performance. If camera shake is not an issue in your installation, best performance will be achieved with this setting disabled.

NOTE: Only enable the features which are necessary for the deployment scenario. Since each feature consumes a portion of system resources, enabling features which are not required may degrade the overall system performance.

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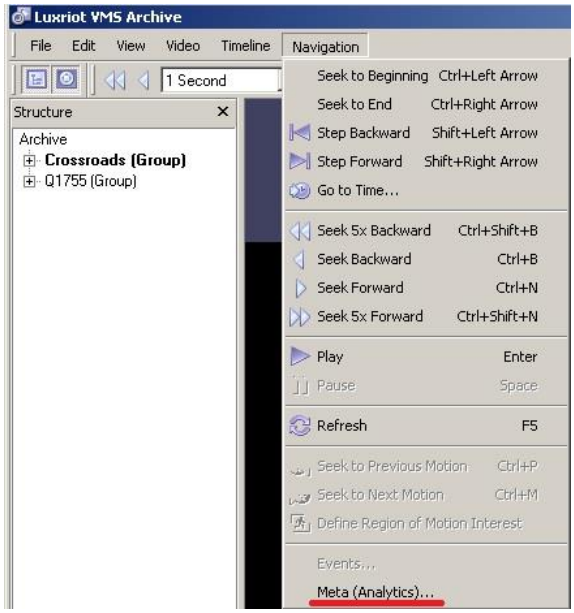
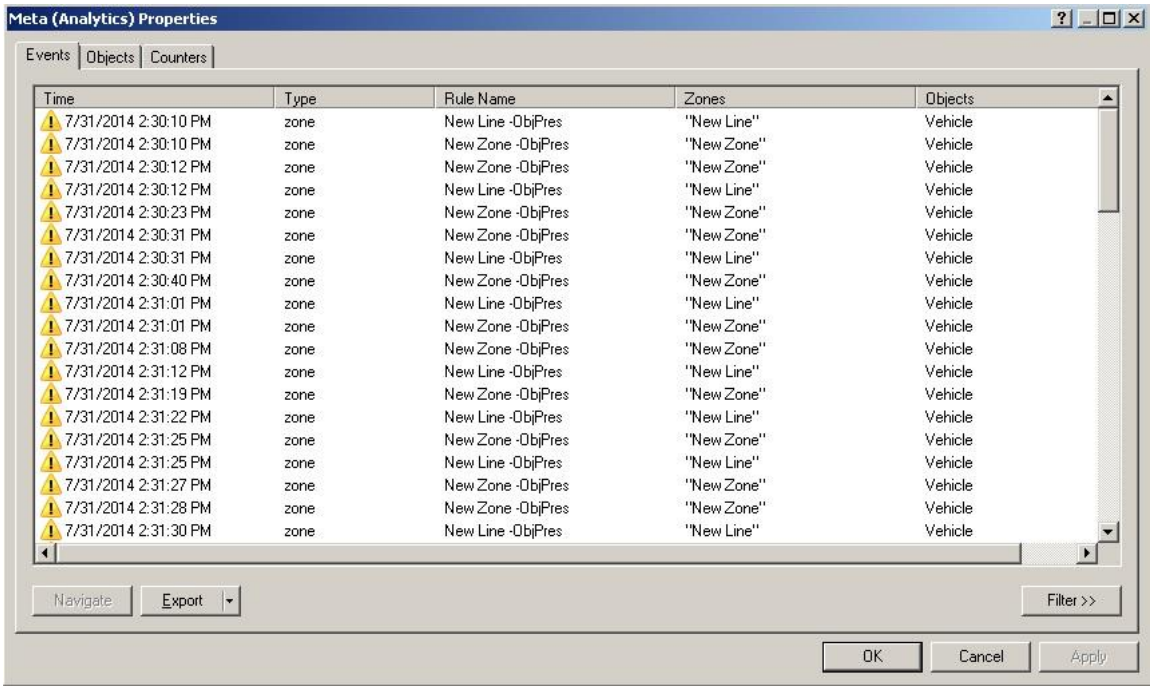
Handling VCA Events in Ganz ZNS

Event History

The event history controls are located in Archive and shows the history of objects that have triggered rules and generated alarms:





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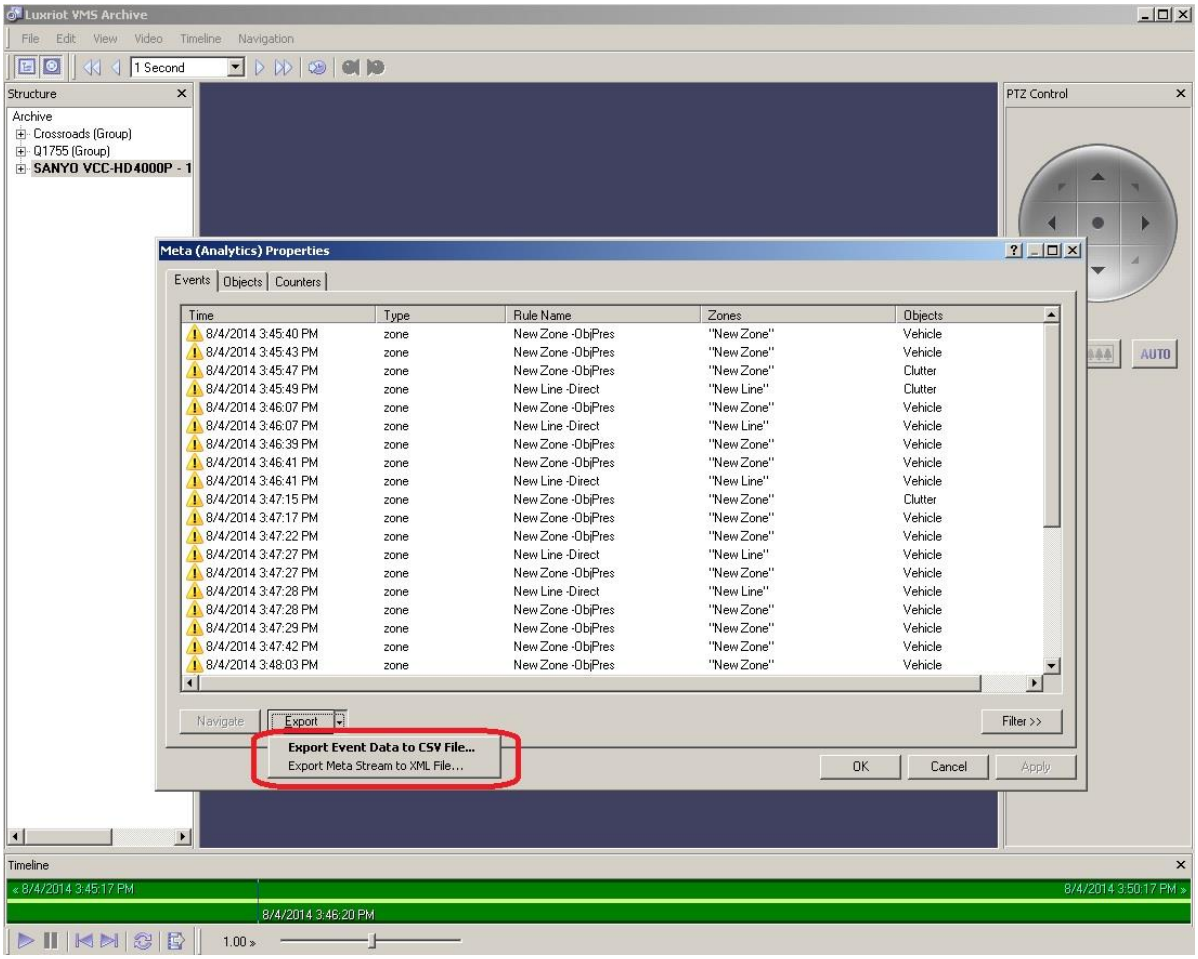
Export Meta (Analytics) Data

To export Meta data to CSV or XML file, select the “Export” button in Meta (Analytics) Properties:



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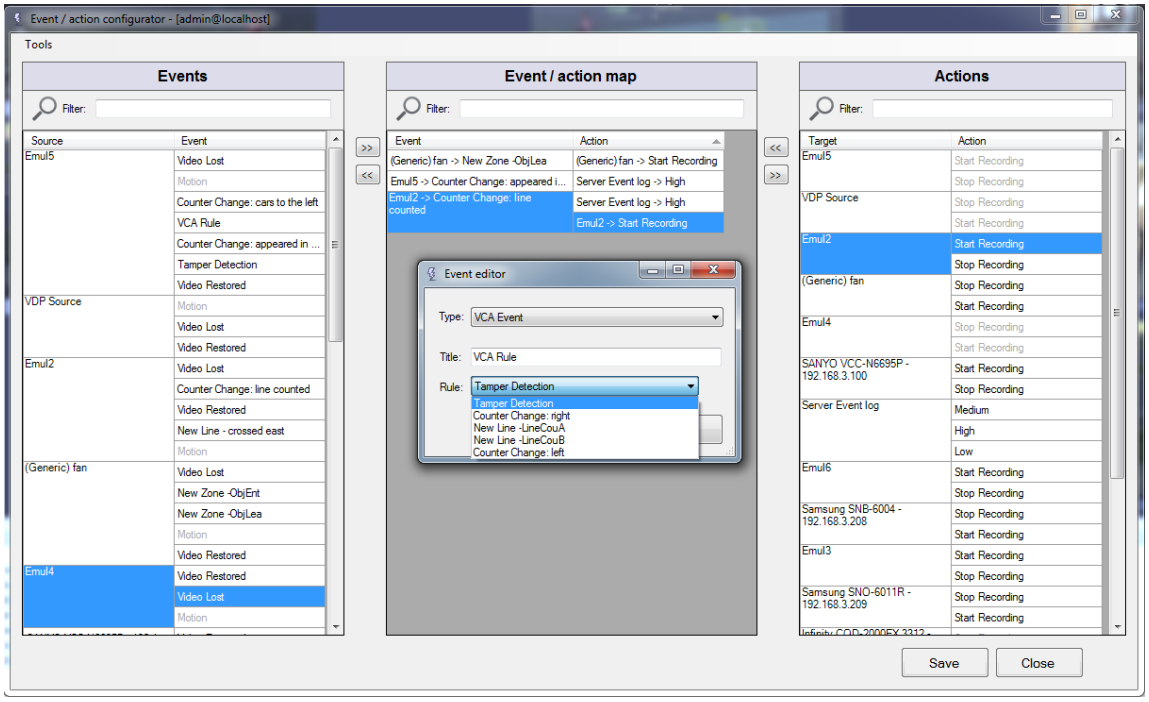
Set Up Actions for VCA Events

VCA events are also available in Event/Action Configurator and can be used for triggering one or multiple standard actions, such as: start or stop recording, send e-mail, pop up camera, run third-party application and others.

For more details, see Ganz ZNS User Guide, section “Event and Action Management Wizard”.

Note that here, once created with VCA Event type source, Event/Action Configurator objects are not automatically updated when VCA object properties are changed. This means, if zone/line/counter settings are modified, corresponding old events in the Event/Action Configurator should be deleted and new events should be created instead, in order to maintain event/action map operability.



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System Requirements

Minimal System Requirements:

Hardware Requirements

• CPU: Pentium Celeron or higher

• Video: Any Graphical card with at least 512 MB RAM and obligatory support of **DirectDraw** acceleration

Software Requirements

• Microsoft Windows 2000, Windows XP, Windows Vista, Windows 7, Windows8

• DirectX 8.0 or later (later recommended).

• MS XML 4.0 or higher

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