Media Server

Software Version 12.0

Scene Analysis Training Technical Note

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Contents

Introduction to Scene Analysis

Scene analysis recognizes events in video that you consider important. Typical examples of objects and events you might want to detect in CCTV footage include:

- A vehicle breaking traffic laws, for example by running a red light.
- Abandoned bags.
- Abandoned vehicles.
- Traffic congestion.
- Zone breaches and trip wire events, for example a person entering a restricted area.

Train Scene Analysis

To run scene analysis, you must create a training configuration that specifies how to detect objects and describes the events that you want to detect. A *configuration* describes all of the events that you want to detect from a single camera.

A configuration can include multiple categories. A *category* describes a single type of event for which you want to generate alarms, for example a vehicle breaching a red light or a person entering a restricted area.

Media Server includes the scene analysis training utility, a Windows application that you can use to rapidly train scene analysis. You can use the Training Utility to:

- Define regions of interest for each category in your configuration.

- Mask parts of the scene that you do not want to monitor for any category.

- Define the size, shape, orientation, velocity, and color of the objects that you want to detect, and the permitted variations in all of these properties.

- Define the position of traffic lights in the scene, so that Media Server can read the lights and generate alarms if an event occurs while the lights are red.

- Display the video being analyzed by Media Server, with an overlay that shows objects being tracked, so that you can confirm objects are tracked correctly.

- Set up filters to reduce the number of false alarms. For example, you might want Media Server to generate alarms only for objects that remain in the scene for a certain amount of time.

- Review the alarms that have been generated using your training, and classify each one as a true alarm for a specific category, or as a false alarm. The training utility can then optimize the training to minimize the number of false alarms and the number of missed alarms.

Create a New Configuration

This section describes how to start a new training configuration.

To create a new training configuration

1. On a Windows machine, open the Media Server installation folder and start the training utility by double-clicking `MSSceneAnalysisTU.exe`.

2. Click **Create a new Scene Analysis config** .

   The training utility creates a new configuration and the **Add New Category** dialog box opens. A category describes a single type of event that you want to detect from the camera. You can add several categories to a configuration, but each configuration must have at least one category.

3. Configure the first category:

Name	The name for the category, for example "Person", or "Abandoned bag".
Object Type	The type of object that you want to detect:

- **Person** adds a sample object designed to detect a person.
- **Vehicle** adds a sample object designed to detect a vehicle.
- **Other** adds a generic sample object.

Movement	The type of movement that should cause an alarm:

- To generate alarms for objects that move into the scene but then do not move, click **Idle**.
- To generate alarms for objects that move in a specific direction, click **Directional**.
- To generate alarms for objects that are initially stationary, but are then removed, click **Removed**.
- If velocity is not an important characteristic for your configuration, click **N/A**. For example, use this option if you want to generate an alarm for any vehicle that moves in the scene, regardless of speed or direction.

Region of Interest	Specify the region of interest:

- To draw your own region of interest on the scene image, click **User Defined**.
- To monitor the entire scene, click **Full Screen**.

Use Color	To detect objects that match a specific color (for example if you want to detect red vehicles but not blue vehicles), select **Use Color**.
Use Other Objects	To generate alarms based on the proportion of the scene that contains objects, select **Use Other Objects**. For example, at a railway station, Media Server can generate an alarm for a detected person if a train is present in the scene.
Use Traffic Lights	To generate alarms only when traffic lights are red, select **Use Traffic Lights**.

4. Click **OK**.

   The Training Utility adds the new category. A dialog box opens, asking if you want to connect to Media Server and obtain a scene image.

5. Click **Yes**.

   The **Save As** dialog box opens.

6. Choose where to save the new configuration and click **Save**.

   A message box opens, which asks you to select "Media Server Session Management". Follow the procedure described in .

Connect to Media Server

1. In the **Media Server Connection** area, confirm or type the following information:

    Host   The host name or IP address of the machine hosting Media Server.

    ACI Port   The Media Server ACI Port. The default Media Server ACI port is 14000. For
                     more information about Media Server, refer to the *Media Server Administration
                     Guide*.

2. Click **Media Server Session Management**.

    The **Media Server Session Management** dialog box opens.

3. In the **Ingest Type** area, click the type of video you want Media Server to ingest:

    - **MJPEG_HTTP** - MJPEG video streamed over HTTP.

    - **MxPEG** - MxPEG video from a file or stream.

    - **LibAV** - video files and streams supported by the `video` ingest engine.

    - **Playlist** - a text file that contains a list of files to ingest, one after another. The text file must
      have one file on each line.

4. In the **Source URL** box, type the URL of the stream or the path of the file that you want Media
   Server to ingest.

5. In the **Ingest Rate** box, choose the ingest rate to use. `IngestRate=1` is suitable in most cases.
   `IngestRate=0` is available only when you are ingesting files. For more information about the
   `IngestRate` parameter, refer to the *Media Server Administration Guide*.

6. In the **Live Video Object Display** area, click one of the following options:

    - **Clickable Objects**. Enables all training utility features, so that you can view tracked objects
      (see Confirm Media Server Tracks Objects, on page 23) and generate alarms for training by
      clicking on objects (see Manually Generate Alarms, on page 25).

    - **All Objects**. Allows you to view tracked objects (see Confirm Media Server Tracks Objects,
      on page 23), but not generate alarms by clicking on objects.

    - **Alarm Objects Only**.

      > **NOTE:**
      > The first two options significantly increase the CPU use (of the Media Server). In a
      > production environment, do not start processing using the training utility. Use the Media
      > Server `process` action instead.

7. Click **Process**.

    - If Media Server is running fewer than the maximum number of processing tasks, it starts
      ingesting the video.

- If Media Server is already running the maximum number of processing tasks, it does not start ingestion but places the new task in a queue. Before you can proceed, you must either wait for processing tasks to finish, or stop them. You can click **Stop Session** to stop a task, and **Refresh List** to refresh the list.

8. In the list of sessions, click the session that you started, and click **OK**.

9. Click **View Live Video**.

   The video being ingested by Media Server is displayed in the Training Utility.

10. Click **Get Training Image**.

    The Training Utility stops displaying live video from the camera and instead displays the captured scene image. You can now begin training.

Use Scene Analysis with a PTZ Camera

You can capture a scene image so that Media Server only generates alarms when the camera is looking at the trained scene. This is useful when you want to analyze video from a pan-tilt-zoom (PTZ) camera, but expect operators to move the camera, because it prevents false alarms being generated when the camera is moved away from the trained scene.

There is no need to capture a scene image if you expect the camera to remain static.

To capture a scene image from a PTZ camera

1. Start viewing live video (click **View Live Video**).

2. Select the **Show Background** check box so that the training utility displays the current background image.

3. Click **Get PTZ Image**.

   The scene image is captured.

4. Click **Set PTZ Image** .

   The training utility displays the scene image that you captured.

5. Select the **Use PTZ Image** check box.

   When using a PTZ scene image, Media Server does not track objects or generate alarms unless the camera is recording the scene identified by the scene image.

Configure Category Details

The category details area specifies settings for the category (a single scenario for which you want to generate alarms). The settings are divided into groups. You can show or hide each group by clicking the title.

Category Details	
Category Name	The name of the category.
Category Enabled	Specifies whether the category is enabled. If a category is disabled, Media Server does not produce alarms for it.
Characteristics specify the criteria to use to decide whether an object should cause an alarm.	
Orientation	To use the orientation of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects with any orientation can cause alarms.
Size	To use the size of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects of any size can cause alarms.
Shape	To use the shape of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects of any shape can cause alarms.
Direction	To use the direction of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects moving in any direction can cause alarms. To specify the direction of an alarm object, see Define the Velocity of an Alarm Object, on page 16.
Speed	To use the speed of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects moving at any speed can cause alarms. To specify the speed of an alarm object, see Define the Velocity of an Alarm Object, on page 16.
Color	To use the color of an object to determine whether it should cause an alarm, select this check box. Otherwise, objects of any color can cause alarms.
Use Traffic Lights	To generate alarms based on traffic light colors, select this check box. If you clear this check box, objects can cause alarms at any time.

Red Light On	When you select **Use Traffic Lights** and **Red Light On**, an object can only cause an alarm when the lights are red. When you select **Use Traffic Lights** and clear **Red Light On**, an object can only cause an alarm when the lights are not red. You might want to generate alarms when the lights are not red for cars crossing a crossroads, because a single camera cannot see the lights controlling traffic from all directions.
Other Objects	To generate alarms when the proportion of the scene covered by other objects is close to a specified value, select this check box. For example at a railway station, Media Server can alarm on a person only when no train is present.
Other Objects%	The percentage of the scene that should contain other objects. When the **Other Objects** check box is selected, Media Server is more likely to generate an alarm when the proportion of the scene covered by other objects is close to this value. Regions under a scene mask are not included when calculating the total size of the scene, so specify the value as the percentage of the scene that is not masked.
Time in Scene / Region of Interest Alarm Filters specify criteria that must be met for an object to cause an alarm.	
Min Time In Scene (seconds)	The minimum amount of time that an object must be present in the scene. The time in scene does not include time in masked areas, because objects are not tracked in masked areas.
Max Time In Scene (seconds)	The maximum amount of time that an object can be in the scene. Objects that remain in the scene for longer than this can no longer cause alarms.
Min Time in ROI (seconds)	The minimum amount of time that an object must be continually present in a region of interest. If an object moves outside a region of interest, its time in ROI is reset to zero.
Max Time in ROI (seconds)	The maximum amount of time that an object can be continually present in a region of interest. Objects that remain in a region of interest for longer than this can no longer cause alarms. If an object moves outside a region of interest, its time in ROI is reset to zero. If regions of interest overlap, the time is not reset when the object moves from one region to another.
Time and Day Alarm Filters filter out alarms at specific times.	
Filter Start Time / Filter Stop Time	Media Server does not generate alarms between the start and stop times. For example, to generate alarms only between 09:00 and 17:00, set **Filter Start Time=17:00** and **Filter Stop Time=09:00**. To generate alarms outside of these times, reverse the start and stop values, for example **Filter Start Time=09:00** and **Filter End Time=17:00**. You can define up to three time ranges.

Filter Weekdays	To apply the time filter specified by the start and stop time on weekdays, select this check box. If you clear this check box, alarms that occur on a weekday are not filtered.
Filter Weekends	To apply the time filter specified by the start and stop time on weekends, select this check box. If you clear this check box, alarms that occur on a weekend are not filtered.
Advanced Variations and Thresholds	
This section contains further alarm filters. To configure these filters, Micro Focus recommends that you classify some alarms and then optimize the category using the alarm classifications (see Classify Alarms, on page 25 and Optimize Category Settings, on page 30).	

Define a Region of Interest

A region of interest is part of the scene in which you expect events to occur. Scene analysis only generates alarms for a category when the center of an object is within a region of interest for that category.

To define a region of interest

1. Click **Draw a Region of Interest** .

2. In the **Scene Image** area, draw a polygon to specify the region of interest.

    a. Click the point where you want to start drawing.

    b. Move the mouse pointer and click the image again. Each time you click another edge is drawn.

    c. Close the polygon by clicking the starting point.

    The training utility displays the completed region of interest. You can draw additional regions if you want to monitor more than one part of the scene.

To erase a region of interest

1. Click **Draw a Region of Interest** .

2. Right-click the region of interest and click **Erase**.

Define the Size, Shape, and Orientation of an Alarm Object

This section describes how to define a sample object. The sample should represent an alarm object as closely as possible. When you draw a sample object, you define the expected size, shape, and orientation of objects that you want to detect.

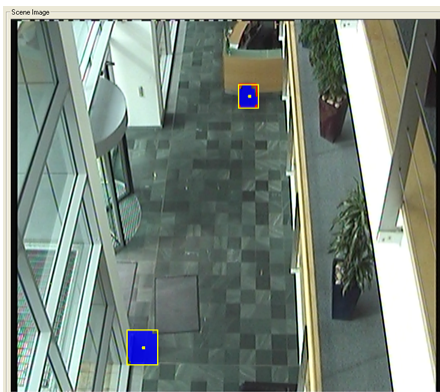Due to the camera angle, objects at the top of a scene might appear smaller (cover fewer pixels) than objects at the bottom of the scene. Draw one example in the foreground and one in the background, as shown below. The Training Utility can then correct for perspective effects.

A pair of sample objects to simulate an abandoned bag

To draw a sample object

1. Click **Switch to object simulation mode** .

   The user interface changes to drawing mode and displays existing sample objects (the training utility automatically adds two samples to every new category).

2. On the toolbar, click one of the brush sizes .

3. On the scene image, modify each "blob" to approximate the size of the object that you want to detect. You can draw sample objects at up to two positions in the scene, so if you want to draw a sample in a new location you might need to erase one of the existing samples first.

   > **TIP:**
   > If the scene image contains an example of the object (for example a person, vehicle, or unattended bag), you can draw over the object.

   - To draw the object, hold down the left mouse button and move the mouse pointer over the object.

   - To erase part of the object, hold down the right mouse button and move the mouse pointer over the object.

The Training Utility shows the simulated object(s). The center of each object is denoted by a yellow dot.

Define the Velocity of an Alarm Object

Scene analysis can generate alarms when the speed or direction of an object matches behavior that is of interest. You must define the expected speed and direction of movement for an alarm object.

The image below shows a velocity vector and range of variation that has been drawn on a sample object in the training utility.
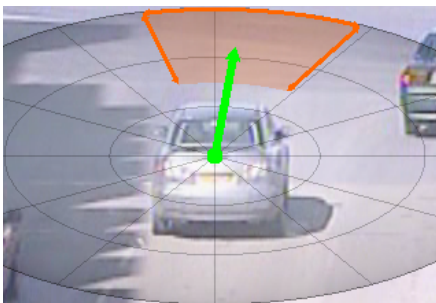

The length of the green arrow represents expected speed (pixels moved per second). The angle at which it is pointing indicates the expected direction of movement. The training utility also allows you to configure some variation in the expected speed and direction. In the example image, after one second has passed, the green dot at the center of the object can be expected to be located anywhere within the orange region.

The amount of variation you should allow depends on the use case. Allow a small variation for objects, such as vehicles on a road, that you expect to have a predicable path and speed. Allow a greater variation for objects where the velocity is difficult to predict, for example a person loitering outside a building.

> **TIP:**
> When you optimize a category, the training utility optimizes the velocity vector and variation based on the values from classified alarms. For information about how to optimize a category, see Optimize Category Settings, on page 30.

Objects can appear to have different velocities depending on their distance from the camera and the angle from which the camera sees them. A camera looking down on a moving object detects movement in all directions. However, a camera mounted at the same height as an object only sees the object move laterally (left and right). Any movement towards or away from the camera is not detected, because the object does not move within the image.

To compensate for these effects, you can specify the camera angle. This aligns the velocity grid in the training utility with the ground that the object is moving on. After performing this alignment you can see that movement vertically within the scene is scaled differently to movement laterally, reflecting the influence of camera angle.

Define a Moving Object

To simulate the velocity of a moving object, follow these steps. To simulate a stationary object (for example an abandoned bag), see Define a Stationary Object, below.

To define the velocity of an alarm object

1. Click **Switch to object simulation mode** .

2. Click **Switch to velocity drawing mode** .

   A circular grid appears over the object.

3. Set the expected speed and direction by dragging the green arrow. The length of the arrow represents speed (pixels moved per second). The longer the arrow, the faster the object is expected to move. The direction of the arrow represents the expected direction of travel.

4. Set the expected variation in speed.

   - Hold the right mouse button, and scroll up to increase the variation or down to decrease it.

   - With the keyboard, press the **Up** arrow key to increase the variation, or press the **Down** arrow key to decrease it.

5. Set the expected variation in direction.

   - With the mouse, scroll up to increase the variation, or down to decrease it.

   - With the keyboard, press the **Right** arrow key to increase the variation, or press the **Left** arrow key to decrease it.

6. Compensate for the camera angle by moving the **Compass Pitch** slider. A compass pitch of 0 degrees represents a birds-eye view where the camera is looking directly down on an object.

Define a Stationary Object

You might want to generate alarms for abandoned objects, which remain stationary. To define the velocity of interesting objects as stationary, follow these steps.

To define the velocity of a stationary object

1. Open **Switch to object simulation mode** .

2. Click **Switch to velocity drawing mode** .

   A circular grid appears over the object.

3. Drag the green arrow to the center of the grid.

A yellow dot appears. The following image shows a stationary velocity vector.

Define the Color of an Alarm Object

Scene analysis can generate alarms based on the color of an object. For example, you can generate alarms for cars only if they are blue. Color differentiation works well when the object has a dominant, uniform color. The more similar the colors between objects in a scene, the harder it is for scene analysis to differentiate between them, so lighting is an important factor in color definition.

To define the color of an alarm object

1. In the **Characteristics** area, ensure that the **Color** characteristic is enabled (select the **Color** check box).

2. Click **Switch to object simulation mode** .

3. Click **Select Object Color** .

   The color palette opens.

4. Define the object color.

   - To define the object color using the color palette, click the color, or click **More** to set a custom color.

   - To define the object color by sampling an object in the scene image, double-click the scene image. Micro Focus recommends that you use this method because it provides the most accurate results.

   The training utility generates a color swatch.

5. Move the **Color Swatch Variation** slider to define the acceptable variation in color.

The color swatches are updated. The center color is the sample that you defined. The other swatches show the upper and lower variations. The amount of variation to set depends on lighting conditions and how closely the sample scene image matches real cases you expect to see.

Define Traffic Light Location

You can configure scene analysis to generate alarms only when traffic lights are red, or not red. This can be useful for detecting vehicles breaching red lights at traffic intersections and level crossings. You might want to generate alarms when the lights are not red in cases where a single camera is used to monitor a crossroads, because the camera cannot see the lights controlling traffic entering the crossroads from all directions.

So that Media Server can read the traffic lights, you must define the location of the lights in the scene.

Scene analysis supports signal detection for both traffic lights and level crossings. You can therefore define up to two red lights, one amber light, and one green light. You do not need to define a location for all of these.

To define the location of traffic lights

1. In the **Characteristics** area, select the **Use Traffic Lights** check box.

2. In the **Characteristics** area, select (or clear) the **Red Light On** check box, so that Media Server only generates alarms when the lights are red (or not red).

3. Click **Set Traffic Light Location** .

   The message "Define Red Light" is displayed in the scene image area.

4. Drag the mouse pointer across the scene image to draw a circle that defines the location of the red light.

   > **TIP:**
   > Try to cover as much of the light as possible, but minimize the overlap into the region surrounding the light.

   The message "Define Green Light" is displayed in the scene image area.

5. Drag the mouse pointer across the scene image to draw the position of the green light. If you are defining traffic lights for a level crossing, or there is no green light, press the right mouse button.

   The message "Define Second Red Light" is displayed.

6. Draw the location, or press the right mouse button to skip the second red light.

   The message "Define Amber Light" is displayed.

7. Draw the location, or press the right mouse button to skip the amber light.

8. Click **Set Traffic Light Location** .

   The training utility returns to the default view.

> **TIP:**
> To confirm that Media Server reads traffic lights correctly, push your configuration to Media Server and start viewing live video. If object tracking is enabled, the Training Utility displays the message "Traffic lights are red" at the top of the scene image window whenever the lights turn red. For information about how to push a configuration to Media Server, see Push a Configuration to Media Server, on page 22.

Define Tripwires

Scene analysis can generate alarms when an object follows a certain path. To define the path that the object must take, draw tripwires in the scene. If you define a tripwire, scene analysis only generates alarms when an object matches all of the characteristics you have enabled (such as object shape and size) and it crosses the tripwire. If you define multiple tripwires, the object must cross all of the tripwires in order.

To create tripwires

1. Click **Set trip wires for category** .

2. In the **Scene Image** area, draw a tripwire. First, click the point where the tripwire should start. Then, move the mouse pointer and click again. Each time you click the tripwire is extended. To finish drawing, click the most recent point again.

   The tripwire is displayed.

3. (Optional) Draw additional tripwires by repeating step 2.

   The number next to the trip wire indicates the position of the tripwire in the sequence. If you define multiple tripwires, an object must cross wire 1 followed by wire 2, and so on.

4. Finish drawing tripwires by clicking **Set trip wires for category** .

5. (Optional) In the category details area, click **Trip Wires** and configure the following settings.

Positive direction / **Negative direction**	Clear either of these check boxes so that Media Server generates an alarm only when an object crosses the tripwire in the direction shown. When both check boxes are selected, Media Server can generate an alarm when an object crosses the tripwire in either direction.
Accel. from prev.	Select this check box to allow alarms when the object has accelerated since crossing the last tripwire.
Decel. from prev.	Select this check box to allow alarms when the object has decelerated since crossing the last tripwire.
Min Time from prev (s)	The minimum amount of time, in seconds, between an

	object crossing the previous tripwire to crossing this tripwire, for an alarm to occur. The training utility optimizes the value when you optimize the category settings (see Optimize Category Settings, on page 30).
Max time from prev (s)	The maximum amount of time, in seconds, between an object crossing the previous tripwire to crossing this tripwire, for an alarm to occur. The training utility optimizes the value when you optimize the category settings (see Optimize Category Settings, on page 30).

To move a tripwire

- Move a tripwire by dragging the points to new locations.

To remove a tripwire

- Right-click the tripwire that you want to remove, and click **Erase**.

Preview the Training

After you have drawn a sample alarm object, defined its expected velocity, and configured any optional parameters such as color, you can view a preview of the training. You can use the preview to assess whether the Training Utility has made suitable approximations of the appearance and movement of the alarm object, or whether you need to adjust the properties of the sample.

To preview the training

1. On the **Categories** menu, click the category for which you want to preview training.

2. Click **Preview** .

3. To preview the size, shape, orientation, and velocity of the sample object, hold down the left mouse button and drag the mouse pointer around within the region of interest.

The following image shows a typical training preview.
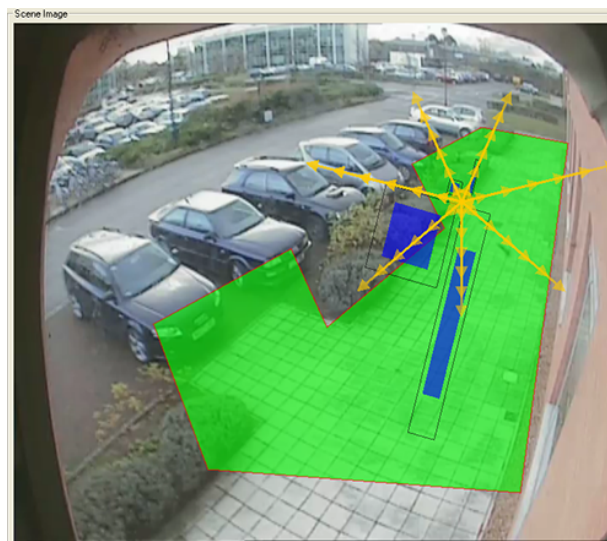
- The inner blue rectangles depict the expected size and shape of alarm objects at the current position. The rectangles above the mouse pointer depict the minimum expected object size, and the rectangles below the mouse pointer depict the maximum expected size. Each pair of rectangles shows the minimum and maximum aspect ratio.

- The outer blue rectangles represent the size and shape of the bounding box around an alarm object. The difference between the inner and outer rectangles shows the difference between the number of pixels covered by the object and the size of its bounding box.

- The yellow arrows represent the expected velocity of an object. If you have defined an object as stationary (for example, to simulate an abandoned bag) the preview presents a stationary red dot at the location of the mouse pointer.

- As you move the mouse pointer, the orientation of the rectangles changes to show the possible orientations. If you defined two examples to correct for perspective effects, the rectangles and velocity indicators change size as you move the mouse pointer up and down the image.

4. If you defined the expected color of the object, you can preview the training for the object color. Hold down both the left and right mouse buttons and drag the mouse pointer over the region of interest.

   Three color swatches appear. The center swatch displays the expected color and the others show the permitted variation.

5. After you have previewed the training, click **Preview** 🔍 to exit preview mode.

   If necessary, modify the properties of your sample object.

Push a Configuration to Media Server

After you have completed training, push the training configuration to Media Server.

To push a configuration to Media Server

1. Save the configuration.

   > **NOTE:**
   > When the Training Utility saves a training configuration file, it also saves a training file (with a `.trn` extension) that contains the training session information in the `Training\` directory. If you want to load the training session at a later date, both the `.cfg` and the `.trn` files must remain in their respective directories.

   > **TIP:**
   > It is important to save the configuration because you might need to adjust it later.

2. Click **Connect to Media Server** .

3. Click **Send Configuration to Media Server**.

   Media Server starts using the configuration to detect interesting activity. If Media Server starts generating alarms, proceed to Classify Alarms, on page 25.

Confirm Media Server Tracks Objects

In the Training Utility, you can view live video and see the objects that are being tracked. You should confirm that objects in the scene are being tracked correctly, because Media Server can only generate alarms for objects that it identifies.
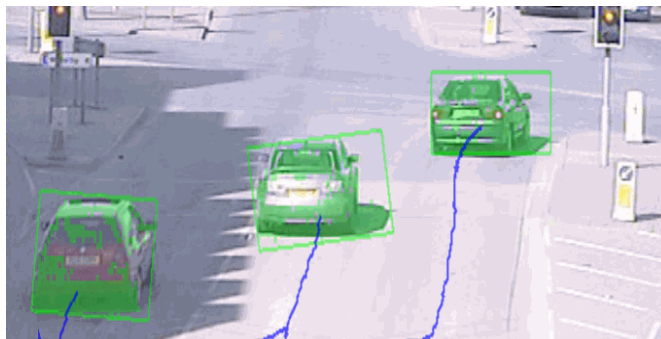
> **NOTE:**
> To show tracked objects, you must have configured the live video object display to show "all objects" or "clickable objects", when you configured the connection to Media Server. If you did not, then start a new session. For information about how to do this, see Connect to Media Server, on page 10.

To view live video, click **View Live Video**. You can customize the video display by selecting or clearing the following check boxes:

Show Bounding Rectangles	Shows a bounding polygon around each tracked object. The color of the bounding polygon changes based on the amount of time the object has

been in the scene.

When an alarm occurs, the object that caused the alarm is highlighted with a red bounding polygon and the message "ALARM OBJECT!" is displayed at the top of the scene image window. The message includes the name of the category that caused the alarm.

If an object causes an alarm, stays in the scene, and then no longer meets the alarm criteria, the color of the bounding polygon around the object changes from red to pink.

Show Active Areas	Displays the active areas of an object (unless the object is a rectangle it will not fill the bounding box completely). The training utility uses a blue to green color transition to show the activity level for active areas of objects. Less active areas are shown in blue and more active areas are shown in green.
Show Object Tracks	Displays a line to show the path an object has taken through the scene.
Show Reference Points	Shows the reference points that you have defined (see Set Reference Points, on page 36).
Show ROIs	Shows the regions of interest that you have defined for the current category (see Define a Region of Interest, on page 14).
Show Category Trip Wires	Shows the tripwires that you have defined (see Define Tripwires, on page 20).
Show Background	Shows the background image that Media Server is using to identify objects. For example, if you are monitoring a scene of a busy road, the background should show an empty road.

Background Objects

You can use scene analysis to detect abandoned objects. For example, airports and shopping malls are interested in abandoned bags and highways agencies are interested in vehicles that are parked illegally.

To detect abandoned objects, you would set a high value for the *Min Time in Scene* or *Min Time in ROI* alarm filter. However, when an object is stationary for longer than the *background update* interval, Media Server adds the object to the background. It is likely that an abandoned object will be added to the background before it causes an alarm. So that it can track stationary objects for longer than the *background update* interval, Media Server creates a template of the object. Templates are created for all objects that match a simulated object where the simulated object has zero speed and the *Min Time in Scene* or *Min Time in ROI* for the category is longer than the *background update* time. For more information about the *background update* and *stationary time* settings, see Configure Scene Analysis Settings, on page 34.

When you view live video in the Training Utility and enable object tracking, the Training Utility shows template objects that have been added to the background. These objects are always stationary. They might have already caused alarms, or might cause alarms when the *Min Time in Scene* is reached. Template objects that have not caused alarms are surrounded by an orange tracking rectangle.

Template objects that have already caused alarms are surrounded by a red tracking rectangle. To see how long a template object has been in the scene, click the object.

Manually Generate Alarms

You can use the Training Utility to manually generate alarms for objects. You can then classify these alarms and use them to improve the training.

> **NOTE:**
> To manually generate alarms, you must have configured the live video object display to show "clickable objects", when you configured the connection to Media Server. If you did not, then start a new session. For information about how to do this, see Connect to Media Server, on page 10.

To generate alarms

1. Connect to Media Server and click **View Live Video** (with object tracking enabled).

2. When an object appears in the scene, click the object. You can identify objects that should cause an alarm and objects that should not cause an alarm.

   A message is briefly displayed at the top of the scene image window, to inform you that an alarm has been generated.

3. After you have generated some alarms, you can use them to train scene analysis. First, you must classify all of the alarms that you generated. For information about how to do this, see Classify Alarms, below.

   > **TIP:**
   > When you classify alarms, the Training Utility displays the scene image at the time of the alarm. The object that caused the alarm is surrounded by a rectangle, which is green for user-generated alarms and red for system-generated alarms.

Classify Alarms

After Media Server has generated alarms based on your training configuration, you can classify these alarms as true or false, and then use these classifications to optimize the original training configuration.

To classify alarms

1. Click **Connect to Media Server** .

2. Click **Classify Alarms**.

   The alarm review dialog box opens.

3. (Optional) Choose the alarms that you want to review and classify. In the **Show** list, click an

option:

- To review all alarms, click **All**.

- To review only those alarms that you generated manually, click **User Defined**.

- To review only those alarms that were generated for a specific category, click the category name.

The scene image area displays a still image from the first alarm. By default, the alarms are ordered by the size of the alarm object with the largest objects being shown first. This is because in many cases, larger alarm objects are more likely to represent true alarms. If you would prefer to sort the alarms by the time that the alarms occurred, click **Sort By Time**.

4. (Optional) You can customize the view by selecting or clearing the check boxes in the **Display Options** area:

Overlay Box	Shows the bounding box around the alarm object.
Overlay Velocity	Shows the velocity of the alarm object (an orange arrow that shows the distance moved in one second).
Overlay Track	Shows the path of the object before the alarm occurred.
Overlay Future	Shows the path of the object after the alarm occurred.
Overlay ROIs	Shows the regions of interest at the time the alarm occurred.
Overlay Trip Wires	Shows the position of any tripwires that were defined at the time the alarm occurred.
Enhance	Enhances the scene image.
Show Details	Shows detailed information about the alarm, such as values and thresholds for the alarm filters.

5. Classify the alarm by selecting one of the following options from the **Cat** (category) list:

- If the alarm represents an interesting event, click the category name to which the alarm belongs (if the category is already correct, go to the next step).

- If the alarm is a false alarm, click **False Alarm**.

- If it is not possible to tell whether the alarm represents an interesting event, click **Ignore**.

> **NOTE:**
> Sometimes you might need to classify alarms where the object has not been identified or tracked correctly. If you are attempting to generate alarms for cars turning left, and Media Server correctly generates an alarm for a car that turns left but the velocity indicator shows that the car was identified as moving forwards, choose **Ignore** so that the alarm is not used for training. If you classify the alarm as an interesting event for the relevant category, this could cause false alarms in future.
>
> Sometimes an object causes an alarm when it should not, despite meeting the filter criteria. For example, a person walking left might be incorrectly identified as walking right

> and cause an alarm, because walking right is an alarm condition. In this case, Micro Focus also recommends that you choose **Ignore**.

6. Click **Set alarm**.

   The training utility advances to the next alarm.

7. Repeat steps 5 and 6 for all of the alarms. If you need to move between the alarms, click the following buttons:

`|<`	Go to the first alarm	`>|`	Go to the last alarm
`<<`	Go back 10 alarms	`>>`	Go forward 10 alarms
`<`	Go to the previous alarm	`>`	Go to the next alarm

8. Click **Apply Classifications**.

9. (Optional) If there are remaining alarms that you did not classify and you want to delete these alarms, click **Delete All Alarms**.

10. Click **Exit and Save**.

11. You can now use the classified alarms to refine the region of interest (see Refine the Region of Interest, on the next page) and optimize the category settings (see Optimize Category Settings, on page 30).

Review and Modify Alarm Classifications

This section describes how to review classified alarms. If necessary you can edit or delete the classifications. You might need to edit or delete classifications if you create a new category to detect a different type of event but those events were previously classified as false alarms.

To review and modify classified alarms

1. Click **Review Classifications**.

   The review classified alarms dialog box opens.

2. (Optional) Choose the classified alarms that you want to review. In the **Show** list, click an option:

   - To review all classified alarms, click **All**.

   - To review all alarms classified as false, click **False**.

   - To review alarms classified as true alarms for a specific category, click the category name.

   The scene image area displays a bounding box and velocity indicator that represents the position and velocity of the alarm object. The smaller rectangle inside the bounding box represents the size

of the object in relation to the bounding box (the *fullness*). The color of this inner rectangle represents the color of the alarm object.

You can navigate through the alarms using the following buttons:

|<	Go to the first alarm	>|	Go to the last alarm
<<	Go back 10 alarms	>>	Go forward 10 alarms
<	Go to the previous alarm	>	Go to the next alarm

You can customize the scene image display using the following options:

Current ROIs	Show regions of interest (at their current size and location, which might be different to when the alarm occurred).
Current Trip Wires	Show tripwires (at their current size and location, which might be different to when the alarm occurred).
Show Details	Show more detail about the alarm, for example alarm filter values.

3. (Optional) Make any modifications that are required:

   - To delete all of the alarms that you have chosen to show in step 3 (all alarms, false alarms, or true alarms for a specific category), click **Delete *class* classifications**, where *class* is "all", "false", or the name of the category.

     The training utility sets the category for all of the chosen alarms to "Delete". The alarms are not deleted immediately but are deleted when you click **Exit and Save**.

   - To modify the classification for an alarm, change the classification in the **Cat** list. You can change the classification to:

     ○ **False Alarm** - classifies the alarm as a false alarm.

     ○ **Delete** - deletes the classified alarm so that it is not used for optimizing the configuration.

     ○ (*Category name*) - classifies the alarm as a true alarm for the selected category.

     After changing the classification you can navigate to other alarms. When you are finished reviewing and changing classifications, go to the next step.

4. Click **Exit and Save**.

Refine the Region of Interest

The Training Utility can overlay the position of classified alarms on the scene image. This can help you to refine the region of interest. For example, if there are many false alarms on the edge of the region, you can reduce the size of the region.
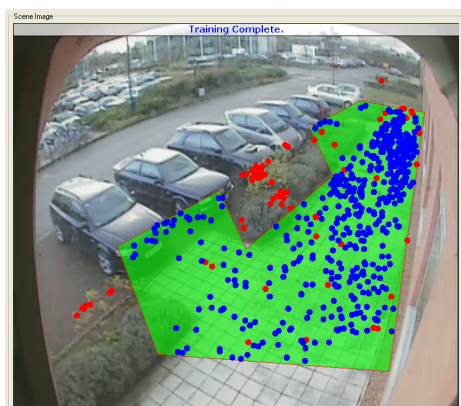
To refine the region of interest

1. On the **View** menu, click the category that you want to modify.

2. Click **Draw a region of interest** .

3. Click **Show locations of classified alarms** .

    The training utility shows the position of classified alarms on the scene image. The blue dots represent alarms you classified as true alarms and the red dots represent false alarms.

4. Modify the region of interest.

    - To change the shape of the region, drag the corners to new locations.

    - If necessary you can erase the current region of interest and draw a new region:

        a. Right-click the region of interest and click **Erase**.

        b. Click the point where you want to start drawing the new region of interest.

        c. Move the mouse pointer and click the image again. Each time you click another edge is drawn.

        d. To close the polygon and finish drawing, click the starting point.

    The training utility displays the completed region of interest.

Replace the Sample Object

To improve the training you can use a real alarm object to replace the sample object that was created when you created the category.

To replace the sample object

1. Click **Connect to Media Server** .

2. Click **Classify Alarms**.

   The reviewing alarms dialog box opens.

3. Navigate to an alarm where Media Server has identified a true alarm object.

   > **TIP:**
   > To show the location of the alarm object in the **Scene Image** window, select the **Overlay Box** check box.

4. In the **Category** box, select the category for which you want to change the simulated object.

5. Click **Set As Simulated Object**.

   A message box opens, asking you to confirm.

6. Click **Yes**.

   The sample object is replaced.

   > **NOTE:**
   > If the category has two example objects to correct for perspective effects, the sample closest to the alarm object is changed.

Optimize Category Settings

The training utility can optimize the settings for a category based on the alarms you have classified. This reduces the number of *false* and *missed* alarms by making your sample objects more closely resemble real alarm objects and by optimizing alarm filters.

- *False alarms* are events that scene analysis identified as interesting, but were not.

- *Missed alarms* are events that scene analysis should have identified as interesting, but did not.

Sometimes it is not possible to eliminate all false alarms and all missed alarms, and you must decide what to do:

- Minimize the number of missed alarms when you want to prioritize capturing true alarms over reducing the number of false alarms. This might result in Media Server generating some false alarms.

- Minimize the number of false alarms when you want to prioritize eliminating false alarms over capturing true alarms. This might result in some interesting events being missed.

> **NOTE:**
> To optimize the category settings, you must have classified a sufficient number of alarms. For information about how to classify alarms, see Classify Alarms, on page 25

To optimize the category settings

1. On the **Categories** menu, click the category that you want to optimize. This procedure only modifies the sample objects and alarm filters for the current category.

2. Click **Optimise '*Category*'**, where *Category* is the name of your category.

   The training utility calculates the effect of changing the category settings. If you have enabled many characteristics (for example object size, speed, direction, and color), this can take some time.

3. Choose whether to include the Min Time in Scene and Min Time in ROI alarm filters when optimizing the category. If you have set these filters and do not want to change the values, clear the **Optimize Time Filters** check box. For example, you might want to fix these values to detect a person loitering. If the check box is selected, the training utility might change these alarm filters to reduce the number of false or missed alarms.

4. Choose how to optimize the category:

   - To suggest the best overall balance between false and missed alarms, click **Auto Suggest**.

   - To minimize the number of missed alarms, drag the slider towards **Minimize Missed**.

   - To minimize the number of false alarms, drag the slider towards **Minimize False**.

   After you have made a choice and have released the mouse button, the training utility shows the number of false and missed alarms that would occur if you optimized the category. Select the **Display Extra Detail** check box to see more information about why classified alarms are filtered.

5. (Optional) You can add or remove characteristics and see whether this improves the number of false and missed alarms. In the **Characteristics** area, select or clear the check boxes, such as **Orientation**, **Size**, **Shape**, **Direction**, and **Speed**. For example, if all alarm objects have a similar size but can have any orientation, you should probably select **Size** and clear **Orientation**. The training utility shows you the effect that adding or removing characteristics has on the number of false and missed alarms.

6. Decide whether to optimize the category.

   - To optimize the category and view the changes made to the configuration, select the **Display Extra Detail** check box and click **Optimize**.

   - To optimize the category without showing the changes, clear the **Display Extra Detail** check box and click **Optimize**.

   - If you do not want to optimize the category, click **Cancel**.

Create Additional Categories

Create additional categories if you want to generate alarms for different scenarios that might take place in the scene.

When you optimize a category, the training utility considers any alarm that you have classified as a true alarm for one category as a false alarm for another. For example, you might have a category to detect people loitering and a category to detect abandoned bags. Any alarm that you classify as a true alarm

for the "people loitering" category is considered as a false alarm for the "abandoned bags" category. A person has different characteristics to an abandoned bag, so the training utility can use the characteristics of the alarm object to optimize the training for both categories.

> **TIP:**
> Switch between categories using **Categories** menu.

To add another category

1. Click **Add Category** .

   The **Add New Category** dialog box opens.

2. Configure the category as required and complete the relevant training:

   - Define a Region of Interest

   - Define the Size, Shape, and Orientation of an Alarm Object

   - Define the Velocity of an Alarm Object

   - Define the Color of an Alarm Object

   - Define Traffic Light Location

   - Classify Alarms

   - Refine the Region of Interest

   - Optimize Category Settings

Mutually Exclusive Categories

When a scene analysis configuration contains more than one category, an object in the scene can cause an alarm for each category. For example, if you have a category to detect any car in the scene and another to detect cars turning down a one-way street, an object can cause an alarm for both.

In some cases, you might want to prevent an object that has caused an alarm in one category from causing an alarm for another. In this case, you can make the categories *mutually exclusive*.

To make categories mutually exclusive

1. On the **Categories** menu, click the name of one of the categories.

2. In **Mutually Exclusive Categories** area, select the check box for each category that is mutually exclusive with the one you selected.

Set Scene Masks

There are often parts of a scene that add no value when monitored. If you are sure a region will never contain interesting activity, you can instruct scene analysis to ignore it by drawing a scene mask. This

can filter out false alarms and improve performance because Media Server ignores activity in the masked regions. Objects in masked areas are never detected or tracked.

An object can only cause an alarm when the center of the object is within a region of interest. If an object is outside a region of interest but is not in a masked area, it is in a *non-alarm zone*. The object is detected and tracked, but cannot cause alarms. Time spent in a non-alarm zone contributes to the object's total "time in scene".

> **NOTE:**
> A scene mask applies to every category in your configuration.

To add a scene mask

1. Click **Mask uninteresting scene areas** .

   The training utility displays regions of interest (with a green boundary), and any masked areas (filled red).

2. In the **Scene Image** area, draw the region that you want to mask.

   a. Click the point where you want to start drawing.

   b. Move the mouse pointer and click the image again. Each time you click the training utility draws another edge of the polygon.

   c. To close the polygon and finish drawing, click the starting point.

      The training utility displays the masked region.

3. (Optional) To mask another region of the scene, repeat step 2.

4. To finish drawing scene masks, click **Mask uninteresting scene areas** .

To remove a scene mask

1. Click **Mask uninteresting scene areas** .

   The training utility displays regions of interest (with a green boundary), and any masked areas (filled red).

2. Right click the region to remove and click **Erase**.

3. To finish drawing scene masks, click **Mask uninteresting scene areas** .

Configure Scene Analysis Settings

You can modify the following settings to optimize object detection and tracking. These settings apply to every category in the configuration.

To modify the settings, click **Scene Analysis Configuration Settings** .

Video Source	
Camera Moving	If the camera is on a moving platform, or is panning or rotating, select this check box. Media Server attempts to compensate for the movement when it analyzes the scene.
Analysis Settings	
Auto Luminance	(Only available for moving cameras) To automatically determine the most appropriate Luminance Threshold, select this check box. You can then specify the minimum and maximum threshold.
Luminance Threshold	(Only available for moving cameras) The difference in intensity required between the foreground and background for Media Server to determine that a group of pixels represent an object. The lower the Luminance Threshold, the more objects are detected. To set the Luminance Threshold, clear the **Auto Luminance Threshold** check box.
Active Area Threshold	(Only available for fixed cameras) The level at which areas of the image are considered to be active. Reducing the value means that Media Server is more likely to consider parts of the scene as active. The default value of 80% is suitable for most scenarios but you might need to use a lower value for low-contrast scenes.
Background Update	Media Server identifies objects by comparing a scene to a known background image. This parameter controls the amount of time that must elapse before an object in the foreground is added to the background image. The default background update time is 60 seconds.
Shadow Removal Strength	Media Server can remove shadows from objects to more accurately determine an object's shape and size. This threshold specifies which areas are considered to be shadows. Higher values are more likely to remove shadows, but if you increase the value too far you risk removing areas that are not shadows.
Tolerance	The Tolerance specifies the confidence level required to determine that objects in different frames are the same. The higher the tolerance, the more likely it is that objects are considered the same. Media Server makes these calculations based on an object's distance from its previous position, relative to its size.

Stationary Time	The amount of time after which a template is created for a stationary object.
	An object could move into the scene and satisfy all of the alarm criteria except "time in scene". However, after the Background Update interval, a stationary object is added to the background. So that the scene analysis engine can continue to monitor the object, it creates a template of the object.
	The Stationary Time must be less than the Background Interval.
Dormant Track Thresh	The amount of time during which an object can be recovered if it disappears and reappears within the scene. For example, if a person walks behind a car, they are considered as the same person only if they reappear before the dormant track time has elapsed.
Expiry Time	The maximum amount of time to continue tracking stationary objects.

Background Type

Micro Focus recommends the **Multi Layer** background type in most cases, but this background type cannot be used with moving cameras. Set the Background Type to **Complex** only when the background is never unobstructed for longer than the background update time.

Fine Tuning

Use Limits	To generate alarms only when the detected object is within the upper and lower limits of any parameter (for example object size, velocity, and so on), select this check box.

Object Smoothing

Media Server can smooth the edges of objects. Object smoothing can help detect objects correctly in busy or low-contrast scenes.

- **None**. No object smoothing.

- **Open**. Opening can help to isolate and separate objects that are in close proximity. For example, if you are tracking large numbers of people in a scene, open object smoothing can help prevent multiple people being detected as one object.

- **Close**. Closing can connect parts of an object and fill gaps, preventing a single "real" object being detected as multiple small, separate objects. Closing can help to detect objects correctly in low-contrast scenes.

Set Reference Points

You can set reference points in the scene so that you can reposition the camera if it is moved, and avoid the need to alter the scene analysis configuration.

To define reference points

1. Click **Set Reference Points** .

2. On the scene image, drag a box around the first reference area.

3. On the scene image, drag a box around the second reference area.

4. Click **Set Reference Points** again.

   The reference points are saved. After you have sent the configuration to Media Server (see Push a Configuration to Media Server, on page 22) you can view the reference points (select the check box **Show Reference Points**, and click **View Live Video**).

Troubleshoot Scene Analysis

This section describes how to solve some problems that you might encounter when using scene analysis.

Objects are not detected or tracked

To generate alarms correctly, Media Server must be able to detect and track objects that appear and move within the scene.

To check that Media Server is detecting objects correctly, push your configuration to Media Server (see Push a Configuration to Media Server, on page 22). View the video being analyzed, with object tracking enabled, and watch the scene image window as objects move through the scene. With object tracking enabled, the Training Utility highlights objects that are detected (see Confirm Media Server Tracks Objects, on page 23).

If interesting objects are not detected, you might need to adjust the following settings:

- **Luminance Threshold** or **Active Area Threshold**. Objects that are a similar color and luminosity as the scene background are more difficult for Media Server to detect. If Media Server does not reliably detect these objects, consider reducing the Luminance Threshold or Active Area Threshold. The Luminance Threshold specifies the difference in intensity required between the foreground and background for Media Server to determine that a group of pixels represent an object. The Active Area Threshold specifies the level at which areas of the image are considered to be active. It is important to set these settings if you are attempting to detect objects in low-contrast or low-light images, for example during the night.

- **Background Update**. Media Server identifies objects by comparing a scene to a known background image. The Background Update setting specifies the amount of time that must elapse before an object in the foreground becomes part of the background image. If the Background Update time is shorter than the Min Time in Scene then stationary objects can be added to the background image and are never detected.

- **Scene Mask**. Objects in non-detection zones are ignored. Check whether the scene mask is preventing objects from being detected (see Set Scene Masks, on page 32).

- **Min Time in Scene**. Media Server does not generate alarms for objects until they have been in the scene for longer than the Min Time in Scene.

- **Track Scope**. To detect stationary objects, ensure that the **Track Scope Min** is zero (`0.0`). This is the distance that an object moves, relative to its width.

Media Server generates too many false alarms

If Media Server generates too many false alarms, use alarm filters to exclude the false alarms. For example, you can remove false alarms generated by transient objects by using the Min Time in Scene filter. The best way to set most of the alarm filters is to disable the category, classify the alarms that have been generated, optimize the training using the classified alarms, and then enable the category again. For information about how to classify alarms and optimize a category, see Classify Alarms, on page 25 and Optimize Category Settings, on page 30.

Send documentation feedback

If you have comments about this document, you can contact the documentation team by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on Scene Analysis Training Technical Note (Micro Focus Media Server 12.0)

Add your feedback to the email and click **Send**.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to swpdl.idoldocsfeedback@microfocus.com.

We appreciate your feedback!