White paper

IP camera technology working within Rotakin

The problem, the method & the solution

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1. Introduction

Since the introduction of IP camera technology back in 1996, the Rotakin testing originally established back in 1989 was retained as a method of commissioning CCTV surveillance systems. The Rotakin test target was designed by the Home office to evaluate the performance of Closed Circuit Television security systems.

The coverage test ensures that the cameras are theoretically capable of producing large enough images of intruders wherever that may be in the video detection zone. The test will also show up any blind spots in the CCTV coverage. The detection efficiency test is to determine how well the observer will be able to see a suitable camouflaged intruder whatever the weather or lighting conditions. The combination of these two tests is aimed at demonstrating the limitations of the system in terms of detecting specified types of intruders.

The original Rotakin guidelines that have been included in European Standard: EN 50132 and IEC 62676 specifically specified testing in line with resolution in TV Lines per picture height when the target fills the vertical picture, defined as the 100% Rotakin condition (100%R). The reasoning for this is so that these measurements enable the dimensions of critical details, which need to be seen in a target, to be defined. As the resolution of the IP camera increase and eventually overtook that of its analogue counterpart, and the introduction of digital monitors became more commonly used for surveillance systems it became difficult to configure and commission an IP camera in line with the Rotakin test. The Rotakin tests are based on a traditional analogue 4CIF image which is 704 x 576 pixels, and assuming that all analogue cameras have the same resolution which is commonly correct. However as we have seen over recent years, there is a significantly wider and greater range of IP cameras with varying resolutions from as little as 704 x 576 to replicate that of an analogue camera up to and beyond 3840 x 2160 pixels which is a 8 megapixel camera.

With the ever increasing IP surveillance cameras sales, the European Standard: EN 50132-7 was modified in June 2013, that took into consideration megapixels per meter in order to make a direct comparison with the levels of details seen within Rotakin for 'Identification, Recognition, Detection and Observe'. This now allows specifiers to determine what level of detail an IP camera will capture at specified distances in line with the site operational requirements which is the same as an analogue system. In principle this is an accurate way of bench marking the performance of an IP surveillance system in line with the site operational requirements and guaranteeing that the level of detail captured is sufficient for the purpose in which it is intended. With the inclusion of the level of new detail in the standards documents it means that there is now a comparison between the two technologies.

There have however been some difficulties adopting the new IP standards that are only related to megapixels per meter in specific environments. Whilst the new IP standards guarantee that the level of detail captured is 100% accurate, it is only beneficial for an operational system when used for evidential purposes and when retrospectively interrogated the scene. When a surveillance system is being proactively operated, the level of detail obtained in a live view on a digital screen can be too small for an operator to distinguish objects accurately. The level of detail would however have been guaranteed when using a Rotakin test to commission the surveillance system. This has recently been identified and as a result an addendum has been made to the standards related to the testing and commission of IP surveillance systems. With an appendix now added, stating that live view IP surveillance camera images must comply with the original Rotakin test and be shown as a percentage of screen height once again.

This has obviously created some challenges to manufacturers and system integrators when trying to adhere to a standard that uses terminology in TV lines adopted for a fixed resolution analogue camera aiming to get a captured image to a specific screen height so the level of detail can been seen when live rather than as evidence at a later date.

So how is it achieved and what is required to make an IP surveillance system work within a standard based around an analogue technology?

2. Methodology

2.1 The problem

Many security installations use analytics to automatically detect objects and people within a cameras field of view. These automatic detections can then be sent to an operator's screen for visual verification of the alarm event. Due to the improvement in IP camera technology and the increase in pixel density now available, automatic detection systems are able to see much further and in more challenging conditions than ever before. This improved performance can however have a negative impact on the visual verification requirement of the operator. In longer detection zones, some objects may appear too small on the operator screen, meaning that the secondary visual verification required by the operator is not always possible.

This is shown in the two images below. In the left hand side image, when the subject is near the camera they are clearly noticeable by the operator as they fill a good percentage of the vertical screen height. As shown in the right hand side image, if the subject is at the far end of the scene, even though the automatic detection system may detect them, they fill a much smaller percentage of the vertical screen height. This may cause the operator some difficulties in providing a quick and accurate visual verification of the alarm event.

For this reason, many security system designs still require that when an automatic detection occurs, the object still fills a minimum proportion of the operators screen to enable accurate secondary visual verification of the event.

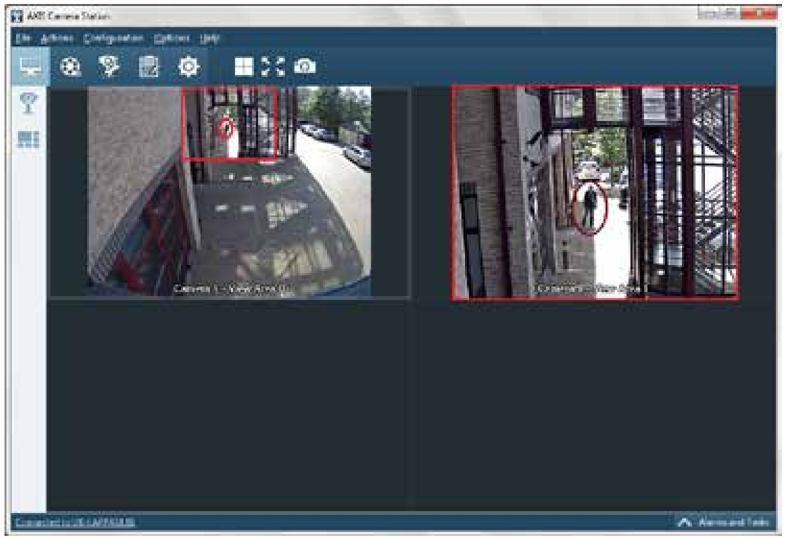
Often the current solution is to use a higher number of standard resolution cameras and shorten the detection zones. This ensures the subject fills a high percentage of the vertical screen height enabling the required visual verification by the operator. Unfortunately these customers miss out on the potential cost saving benefits that come with using higher mega pixel cameras and longer detection zones.

2.2 The Solution

Certain high mega pixel cameras in the Axis range support a function called View Areas. This feature allows individual cropped areas of the image to be streamed from the camera as single virtual cameras. These virtual camera images can be independently viewed and recorded by the Video Management System (VMS).

By using this multi-streaming functionality in combination with different automatic detection zones within a cameras field of view, we are able to show a specific cropped area of the scene on an alarm event, enabling quicker and more accurate visual verification.

In the screen shot below there are two independent camera streams registered to the VMS.



The image on the right is simply a virtual camera created by cropping the area shown from the complete camera image on the left. The result is that the subject now appears as a much higher percent of the vertical screen height and can clearly been seen by any potential operator.

This additional camera image has required no extra hardware to achieve it and depending on the VMS being used, no additional software licences are required as both images are generated from a single IP address (one camera).

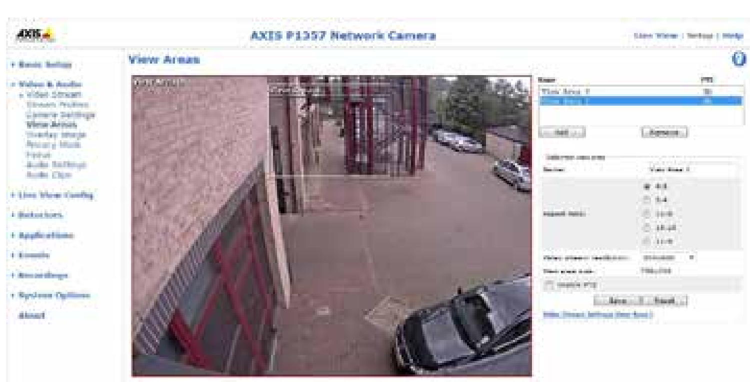
With these extra virtual camera views and multiple zones on the automatic detection system, the VMS can be configured to display different cropped streams depending on which zone is activated maximising the operators view.

2.3 The method

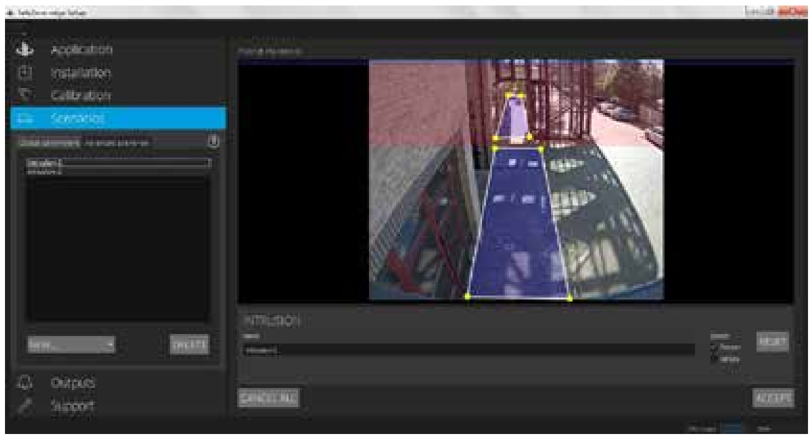
The process below shows the key steps required to achieve the above solution using the following products.

> Axis, 5 megapixel camera with Multi-View streaming capabilities
> AXIS Camera Station 4.1 (ACS)
> i-LIDS primary approved AXIS Camera Application Platform (ACAP) (Digital Barrier, IPS etc.)

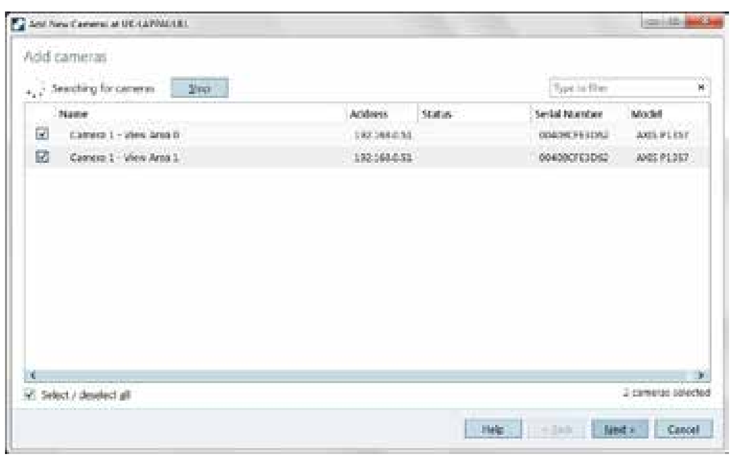
1. Once the camera is installed with the required field of view, the View Areas (virtual cameras) need to be set up. Access the camera menu via the web interface and select the View Area option. In the View Area menu the size, position and image quality settings of the required view area can be configured. Clicking the "Add" button will bring up a white box within the main image which denotes the View Area being set. In this example only one View Area is used however multiple ones can be created. It is important that when creating the view area size, that the same sized box is created to replicate that of a 4CIF/analogue camera image.



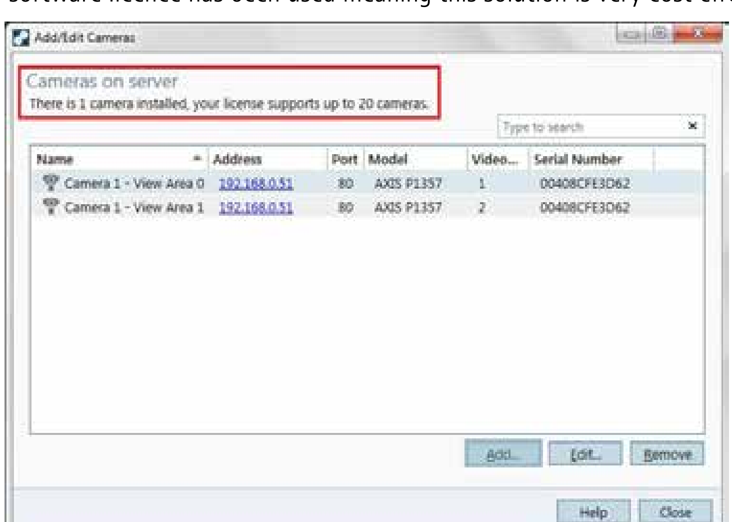
2. In this example an i-LIDS approved AXIS Camera Application Platform (ACAP) software was used as the event trigger. This application is i-LIDS primary approved and sits and runs completely inside the Axis camera, meaning no extra analytics hardware is required. Once installed and configured, two distinct detection zones were set up using the utility within the ACAP chosen software. The zone nearest to the camera would be set to show the standard camera view and the zone furthest away from the camera would be set to show the view area configured above.



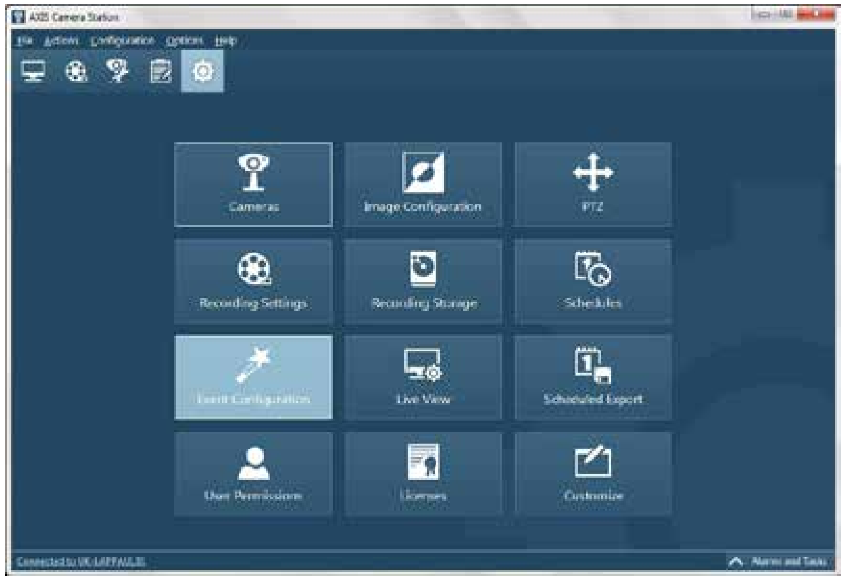
3. The Axis cameras then needs to be registered onto the Video Management Software, ACS. It is important that the View Areas are configured before this step as they need to be added as individual camera streams during this process. ACS is able to automatically detect View Areas configured in the cameras and will display them as available camera channels during its auto search. View Area 0 is always the complete camera view and View Areas 1 and above are for the user defined views.



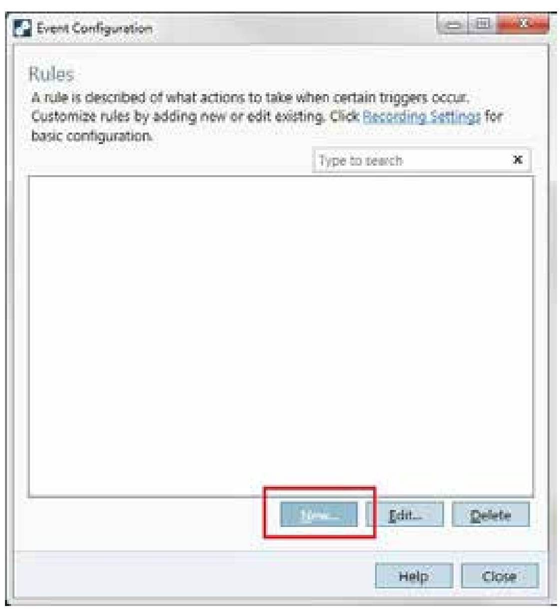
4. In this example, once both streams are added to ACS and the installation wizard is complete only 1 software licence has been used meaning this solution is very cost effective.



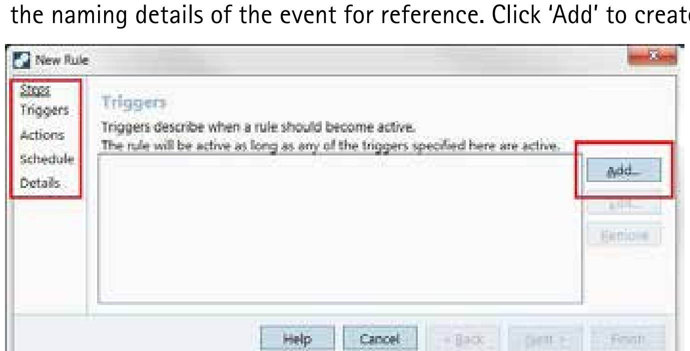
5. The final step in the process is to create event rules within ACS to ensure the correct camera stream appears on the operator client when the different intrusion zones within i-LIDS approved AXIS Camera Application Platform (ACAP) software are triggered. This is done in the Event Configuration Menu in ACS.



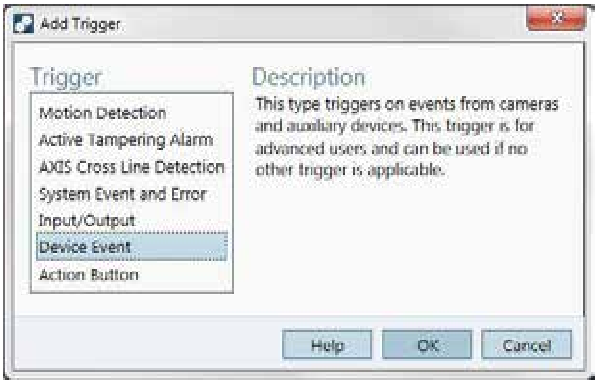
6. Select 'New' to create a new event rule.



7. There are 4 main steps to create an event rule within ACS. These include the trigger for the event (Input), the resulting actions required (Output), the schedule for the event, (when is it active) and finally the naming details of the event for reference. Click 'Add' to create the first input trigger.

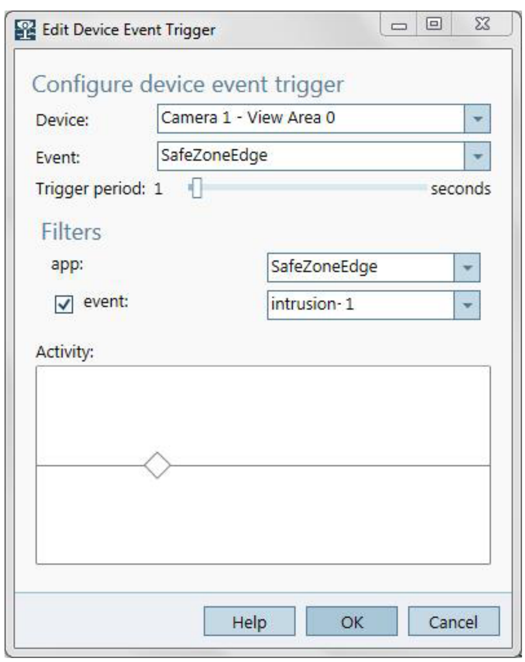


8. In this example, the trigger will be provided by the i-LIDS approved AXIS Camera Application Platform (ACAP) software inside the camera. This is classed as a 'Device Event' in ACS.



9. The device trigger will always be the View Area 0 camera and not any of the user created View Areas (i.e. 1 and above). This is because the ACAP is linked to the main View Area 0 within ACS. If any of the user View Areas are selected here then an error will occure. The selection of which virtual cameras to display is done in the next section.

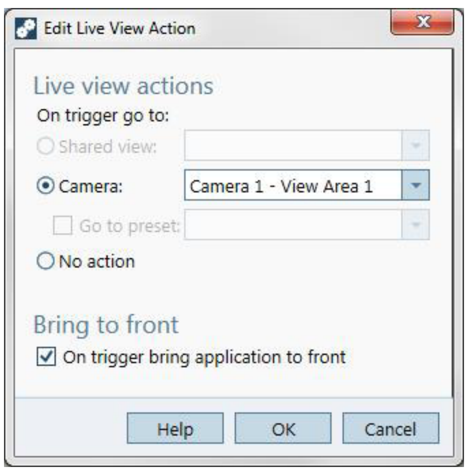
When the correct camera is selected, ACS is able to see all of the different detection zones configured within i-LIDS approved AXIS Camera Application Platform (ACAP) software. Each detection zone will need its own event to be configured within ACS. In this first example Intrusion Zone 1 is being used.



10. Once the trigger configuration is completed, the Event action (Output) needs to be defined. Click 'Add' to access the setup.

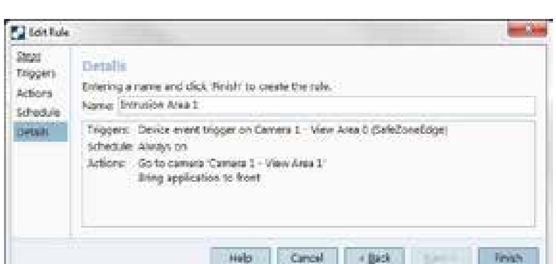
11. Many different output events are available in ACS. In this example, the 'Live View' option is required.

12. The trigger for this event was 'Intrusion detection zone 1'. This is the far zone in the camera's field of view so the cropped View Area 1 is the virtual camera that needs to be displayed when that zone is triggered. Ensure the 'Bring to front' option is also ticked so that the image pops up onto the operator's screen.

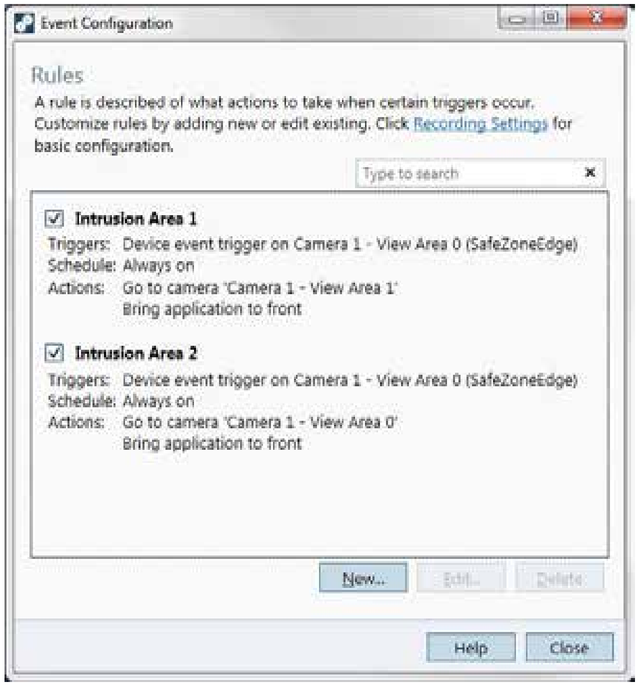


13. Once the Input and Output of the event have been configured, the schedule needs to be set. In this example, the rule will be active all of the time; however it can be set to only run at certain times of the day if required.

14. The final menu re-caps the previous selections and allows a name for the event to be registered. It's important to clearly label the event to assist any future configuration editing which may be required.



15. Once completed, the process needs to be repeated for all other detection zones configured.
In this example, the second event (Intrusion Zone 2) will activate the main camera image (View Area 0) as shown in the summary below.



3. Consultants stance

Martin Grigg of PTS Consulting says 'CCTV surveillance systems have long been installed prior to the introduction of IP cameras. IP cameras have developed over the years and have noticeably increased in resolution well beyond the capability of analogue cameras. But due to these greater levels of resolution we have to carefully consider what we are trying to achieve. Video analytics can detect unusual activity with just a few pixels changing, but an operator could easily miss such an event on a high resolution image. This enhancement in detection technology is a very powerful tool. However if we need to have an operator detect or verify activity then we still need to have a target representing a certain percentage of the screen height, regardless of the pixel density.'

'This commissioning fix detailed by Axis, utilising standard camera features, enables the operational system to run efficiently whilst capturing a greater level of recorded detail. It is great to see manufactures listing to the industry and addressing important challenges that improve the system in which it was intended. I am sure that we will see IP cameras adopted across the Critical Infrastructure segment further, now that usable imagery has been considered. '

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4. Notes & clarifications

The solution detailed above uses specific software programs and camera features that may not be available in in all models. The specific features required for this solution to work are listed below:

> Axis Camera with Multi-Mega Pixel Sensor and multiple View-Area functionality
> Video Management System that supports the Axis View Areas as independent video channels
> Automatic detection analytic that allows for multiple, independent detection zones
> Video Management System that is fully integrated with the chosen analytic or camera so that the different detection zone events can be independently seen and events configured accordingly.
> Video Management System that supports automatic camera pop-up on Alarm event.

5. Thank you

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