

## **Video Alarming and Artifact Protection**

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### **INTRODUCTION**

The Rock and Roll Hall of Fame and Museum (RRHOFM) is the world's leading institution for the display, preservation, and study of Rock and Roll music and artifacts. The RRHOFM is located in Cleveland, Ohio along side Lake Erie, and averages approximately 500,000 visitors annually.

The RRHOFM exhibits many of its artifacts in an open manner. The use of display cases is limited so that visitors can have the most intimate experience possible and see the artifacts in an unobstructed environment. The lighting of the main exhibit hall is designed to provide the best possible experience for RRHOFM guests. The lighting plot calls for areas of dark perimeters around the displays to provide a striking contrast to the spotlight artifacts. There is also extensive use of colored lighting. The net effect is evocative of a rock concert audience in the dark, the artists washed in light of varying intensity and tone. The security challenges the lighting design presents, while pleasant for the visitor are significant and complex for the organization.

A review of the security program at the RRHOFM identified a need to improve the security of both the physical building and its collection. The process began with a review of the many different security systems commercially available. Options ranged from a microwave based system to laser beam detection based systems. None of the systems provided the level of security, flexibility, or affordability that the RRHOFM desired. Another solution was needed.

“We had recently completed an up-grade of our CCTV system. We went from an old analog Multiplexer/VCR based system to a digital video recording system. The system is

designed to record on motion when the motion detected exceeds an operator set threshold. The recording sensitivity could be changed with a few keystrokes and the 'motion area' is defined by simple paintbrush-type controls. Thinking about this attribute, I began to wonder if the system's basic features could be expanded to include the ability to sound an alarm when motion is detected. I wondered, could central security and the offending visitor be notified simultaneously or independently? Could I get a near zero false-rate so as to not inhibit the high-quality visitor experience we currently enjoy? Could the whole system be unobtrusive enough to not inhibit our active (and often dancing) visitors yet robust enough to provide the stringent security I demand? Armed with a ton of questions I contacted our vendor, Acuity-vct to see if any of this was possible," said Paul Steiner, Security Manager, Rock and Roll Hall of Fame and Museum.

- Mr. Steiner went on to say, "The goal of the new Artifact Alarming System would be to protect the exhibits from theft and/or damage. To realize this goal we had a number of specific requirements. These included: The need to install additional cameras to cover more artifacts
- The need to install strobe lights in the exhibit areas to alert security personnel when a protection area is breached
- A notification system for our visitor(s) to "please step away from the exhibit" when inappropriate activity is detected
- To be able to utilize as many existing motion sensors, triggers and cameras as possible
- Retrofit our existing Video Capture System (VCS) to meet our new, more comprehensive functional requirements.
- Be able to easily define the alarm areas around the artifacts using draw/paint commands
- Flexibility to temporarily modify the alarming area to allow curators to service the artifacts
- As an area is breached, security personnel in the main security office needs to be notified of the alarm condition via their computer monitors
- The flexibility to be able to quickly modify software settings, such as, number of seconds the strobe light will remain on, the sensitivity level to trigger an alarm, how many seconds before and after motion is detected that the video will be saved.

Acuity-vct was able to address our concerns and meet our needs. The solution required state-of-the art design and implementation. I could not be happier with the result."

## **BACKGROUND**

The original CCTV upgrade included the requirement to use as many of the existing cameras as possible, to achieve the lowest upgrade cost possible. The number of cameras was increased from XX to YY, with additional fixed and PTZ cameras.

The Acuity-vct Video Capture System (VCS) is an IP/network-based digital video recording system and interfaced easily with the existing analog cameras. No additional wiring was necessary.

The new Artifact Alarming System would require 18 additional cameras mounted above the exhibits.

The task to add features to the VCS to meet the RRHOFM's objectives was intriguing. Acuity-vct knew that the potential need from other museums that wanted to protect their property without having obtrusive laser beams or glass walls would open the door for the VCS to be a viable option to Museums.

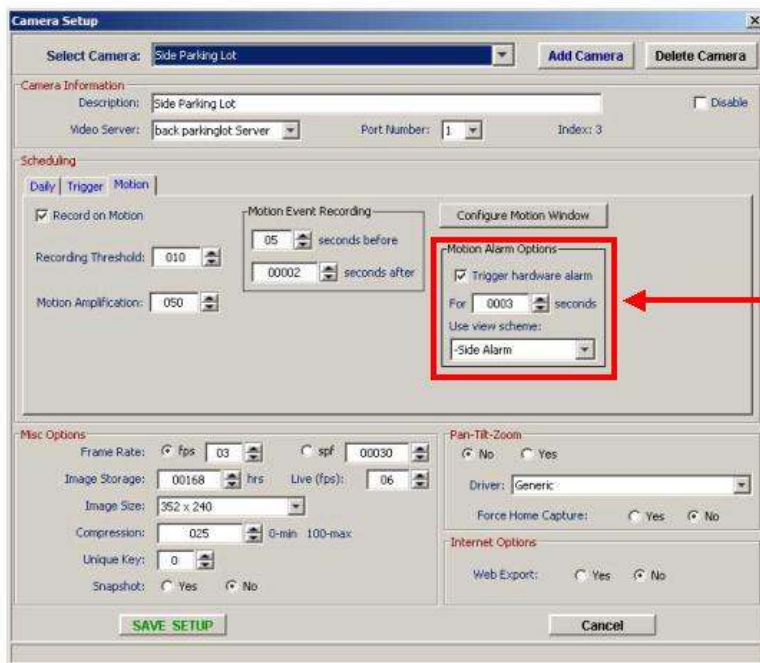
When the original VCS base software developed, it was design to allow for future software and functionality that was not foreseen at the time. RRHOFM and Acuity-vct personnel met to discuss the basic goals and functional requirements.

## DETAILED SOLUTION

There were many software and hardware functions that needed to be added or modified. The VCS software was changed in three areas, 1-the video server/recorder system and the client software; 2-the client software for the VCS system administrator; and 3-the client software for the security guards.

The VCS Client Software modifications for the **System Administrator** to modify camera and alarm settings are shown in the following figure. The new software features are highlighted in the red.

- If the “Trigger hardware alarm” is checked, any motion detected will trigger the strobe light to alert security personnel and an audible sound to the visitor to “please step away from the exhibits”
- The time that the strobe light remains flashing is an adjustable parameter, giving more time for security personnel to determine which area was breached
- A drop-down menu of view schemes is available to choose from. The view scheme should contain the camera that triggered the alarm with other cameras from the same area.



- ◆ Check box
- ◆ Adjustable timer
- ◆ View scheme

When the “Configure Motion Window” is selected in the previous figure, the following figure is displayed for the administrator to define the “alarm areas”. Rectangles and oval shapes and free-hand drawing can be used to maximize the desired area.

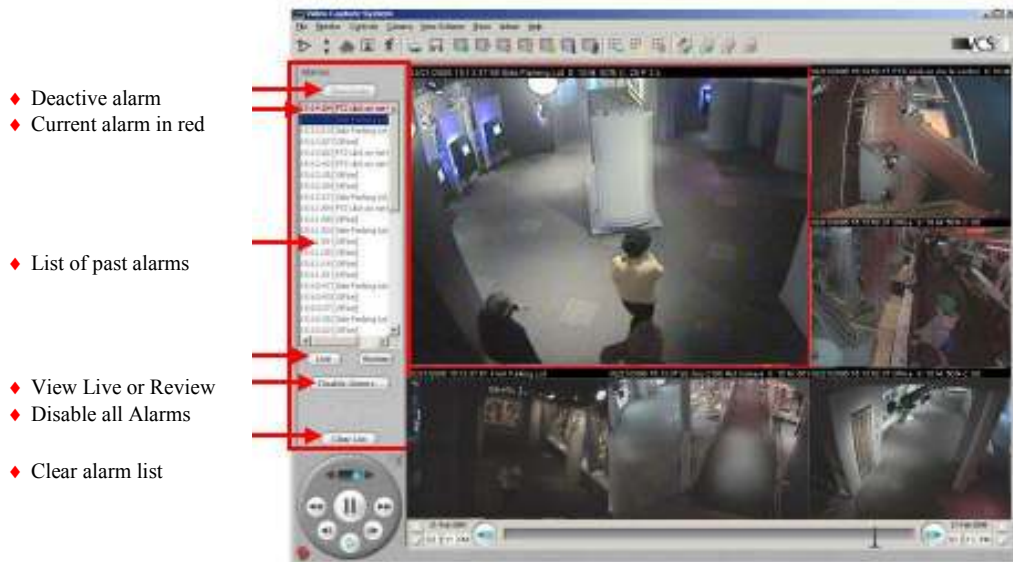


The following VCS Client Software modifications were designed for the **Security Guards** in the main security office. An 'ALERT' button was added to the Live Viewing screen. When the ALERT button turns red, the only action required is to mouse-click the button to bring up live images from the breached area.

◆ Alarm button



When the Alert button is clicked on, the Live screen will change to a Review screen with a list of alarms being displayed on the left part of the following screen (highlighted in red). The “Disable Alarms” are used for a temporary period when the exhibit areas are cleaned or changed.



The same information is available in the Live view mode, as shown below.



Due to agreements between the Rock and Roll Hall of Fame and Museum and various artists, images of artifacts have been ‘blurred’ to hide their identity.

The VCS Server software modifications were:

- To open/close the digital output on an Axis Communications 2400 analog-to-digital converter
- To close the digital output when a motion event occurs and then re-open it when a specified number of seconds has elapsed
- To detect motion from a camera not only to start recording images, but to alarm on it
- Add a new indicator to the system health message that will indicate an alarm condition
- Add a new message to transmit a list of triggered alarms when requested
- Add a new message that will cancel an alarm condition and open the contact on the Axis 2400
- Add a new message that will disable an alarm trigger for a specified period of time
- Modify the VCS software to have multiple alarms & associate a View Scheme to each alarm

## **RESULTS**

“After months of collaboration Acuity-vct’s Video Capture System has meet all of the RRHOFM requirements for an economical yet powerful CCTV/alarm system. The system has increased the RRHOFM ability to provide an outstanding experience for our guests while at the same time protecting our artifacts. An additional bonus of the system is Acuity-vct’s continuing commitment to improve the system. They have included several user requested system up-grades that have increased the effectiveness of the system,” - Paul Steiner.

## **APPENDIX A – Details of the VCS System**

The Acuity-vct Video Capture System (VCS) is a state-of-the-art network digital video recording system. Images from cameras placed throughout one or many facilities to provide video surveillance. Whether the cameras are analog or IP/digital, the VCS stores the images for weeks, months or even years. Images from an IP/digital camera are in a motion jpeg format. Analog video signals are inputs to an A/D converter.

The VCS system converts the analog camera signals to digital image files, processes the image files and archives the required images to a hard disk array. Two separate networks are included, one used exclusively for video camera interfaces and the second to interface to the plant network. This architecture insures that 24x7 video traffic does not interfere with the RROHFM intranet network. Security and management personnel can view the camera images from any PC.

Since the VCS is network-based, any computer using a standard web browser or the VCS Client software is capable of displaying live and archived images via an intranet or the internet.

There are a number of other features the VCS can provide:

- Create multimedia reports that visually explain what happened
- Include images in email, reports, and studies
- Use images or ‘movies’ for operational and safety training
- Use remote Pan-Tilt-Zoom control from any internet-enabled computer to position cameras
- Create a time lapse “video” of any archived images (JPEG or MPEG)
- Unlimited user access at the same time
- Easily change

The flexibility of choosing the right camera for the job is also critical. The VCS is designed to easily integrate with many different camera manufacturers. It also allows for multiple types of cameras, such as, analog, IP digital, wireless, high-resolution mega pixel and pan-tilt-zoom cameras, are all integrated into one system. The VCS Client software shields the users from differences between the camera types.

The VCS is based on a unique concept of total images per second (ips). For example, we can choose to utilize 800 ips in different ways. There can be 200 cameras recording 4ips, or 800 cameras at 1 ips, or in any other combination. Critical cameras can be stored for longer periods of time and at a higher frame rate, than less critical cameras. The same is true for the image storage time. Critical cameras can be stored for more days, less critical for fewer days.

This concept also allows for only one VCS system being needed compared to multiple 16-port DVR solutions when 17 or more cameras are installed.

There are three VCS rack mount servers that are available; an 8, 16 and 24 disk drive system. Each VCS is customized for each application. It's based on a number of parameters: total number of cameras; image/second capture rate; storage length; percent recording activity; and future expansion plans. A VCS requiring 12 disk drives will have 4 spare slots in the 16 disk system, and 12 spare slots in the 24 disk system for future cameras or the decision to increase storage times

In addition to the applications mentioned in this paper, Acuity-vct and its parent company Benchmark Automation, has also developed additional applications to meet the changing requirements in security and manufacturing environment.