Visualization in Security Control Rooms

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Introduction

The traditional security control rooms have used monitor stacks for CCTV (Closed Circuit Television) monitoring ever since these were envisioned. Such monitor stacks were designed allow multiple security personnel the ability to view a specific screen to assess an unfolding situation and to make decisions on what should be done to resolve any issues. In addition, there are many other signals(usually computer outputs) that are required to be monitored in addition to those CCTV signals. These are typically fed to individual operator work stations.

As operations and visualization needs grew, it soon became apparent that the monitor stacks didn't provide the flexibility required. Monitor stacks, once in place, was difficult to move without a lot of structural changes, and the screens were fixed in size and each monitor could only take one camera feed. The cost of running the stacks is high and directly proportional to the number of camera feeds (monitors). Each monitor needs individual tuning and servicing in addition to maintaining, and if necessary, debugging of the cabling involved. In addition, there is a significant amount of heat generated by each monitor (roughly 125W each) that increases the operation costs for electricity and cooling needed in the control rooms.

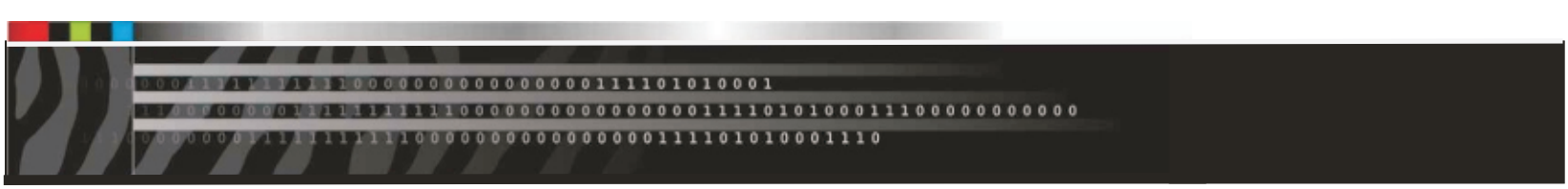
Added to the above, with IP technologies pushing for digitization of video signals, the world of computer signals and CCTV signals started to merge – requiring both signals to be viewed together on many instances to provide context. The stage was therefore set for the new wave of display solutions that would reduce the costs and increase the flexibility to address the concerns of the security control rooms .

The Challenges

The primary challenges of visualization in the security control room (and in most control rooms in general) are the costs, flexibility, ergonomics, collaboration and sharing of information, and integration (or automation).

Costs

Based on today’s technologies, a single rear projector display coupled with the proper controller can project up to 60 camera feeds at any one time. Clearly the images would be too small for practical viewing. Therefore, it’s reasonable to say that one can comfortably see up to 16 images with a single projector that uses 150 watts of power. The traditional approach would use 12 monitors each consuming 150 watts of power. It is evident that a single projector will only consume about 10 times less power than a monitor stack. A more detailed study is available in [1]. In addition, with less power being used there is less heat generated and thus less air conditioning needed resulting is a further decrease in running and initial investment (air
handler) costs.



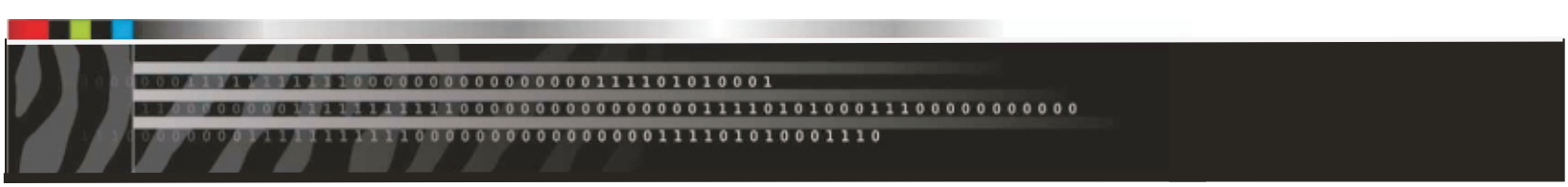
It is also important to note that today's Digital Light Processing (DLP) rear projection systems are best for 24/7 operations compared to any other display systems as they do not have the inherent "burn-in" or "image retention" issues of technologies such as CRT, flat panel plasma or Liquid Crystal Display (LCD) screens [2]. In general therefore, the life time operational and maintenance costs of the solution will be much less compared to these technologies [3].

Flexibility

A single rear projection system can not only show a large amount of images but it can do so in any combination. One image can be large and the rest tiny; they can be all the same source, or any combination in-between. This provides significant flexibility for the operators focus on more important issues with larger viewing areas. In addition, the system should be modular, allowing a myriad of combinations of multiple projection cubes and input options that can configured. Central to this is that the visualization system should be able to display computer graphical images various different means of either direct base band feeds, hosting client software, of as compressed signals over IP networks with both hardware and software encoders and decoders. This means that other types of data, such as those from applications that shows maps of the areas being monitored or access control system logs/alarms and states may be displayed alongside the video of interest to facilitate better and faster decisions by the operator.

Ergonomics

There are clear and obvious benefits to making more information available on a large screen to facilitate collaboration between operators and provide management overview. Decision making is faster as there is no need for the operator to waste time in extraneous navigation functions such as zooming in on the picture or executing complex operations to bring up other feeds from other video sources or even applications. There will also be increased collaboration between colleagues with the large displays as all participants can see the same information including supervisors thus facilitating a natural discourse within the environment. The net result therefore is more information is shared quicker culminating in better operator efficiency and effectiveness. As operations being monitored grow more in size and complexity, the size of the area of concern (e.g. maps) and number of other collaborative systems (other than video) to be viewed simultaneously to enable fast and effective decision making will demand more and more pixel density and sheer physical size. In this, the ability to control multiple displays as one virtual screen to achieve both the needed density of pixels as well as size will be key. Further to that the physical gap between displays must also be minimized to achieve a seamless physical connection to ensure all pixels are viewed correctly and that no line or boundary is obscured. Therefore, with projectors, not only does it provide better operational ergonomics but it also facilitates better future growth.



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Collaboration and Information Sharing

Integration

Finally, information displayed on such intelligent display systems can also be integrated with higher level systems and therefore be “event driven”. This means that higher level software can manage and control the visualization solution to react in a specific manner appropriate to the event detected. For example, specific layouts can be programmed to change with the trigger of an event. This can be any event, such as the recognition of stationery traffic, or anomalies detection (e.g. left baggage or intrusion), or even biometric (e.g. facial recognition) systems, or manual intervention (e.g. central reservation in the event of an accident). The higher level software then triggers the layout to change so that the operator’s attention is drawn to the incident instantly. The visualization solution may be programmed to present the incident in any way appropriate to the operation procedures of the organization. Some simple examples to attract operator attention may be to a red box around the particular screen or to make the window much larger. This functionality is achieved through a published application programmer’s interface (API) that should be presented as part of a function call within the higher level software to allow integrated and fast responses. Such APIs must provide a fully structured two way communication between the higher level program and the visualization system. The API is an indispensable component required for the seamless integration of any visualization for a modern security control room solution.

Conclusions

As discussed in the previous sections, the needs of visualization for the security control rooms today can best be met by blending the best in display ergonomics, networking and integration technologies. This blended Networked Visualization solution is the only real option to provide the needed size, flexibility and intelligence (for networking and control) in order to support faster response times and better collaboration for better decisions as systems grow larger in size and complexity.

References

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