# How “Smart” Technology Makes a Better Control Room

## A discussion with AVI-SPL, Mitsubishi Electric USA, and Crestron

AVI SPL®

An AVI-SPL White Paper

www.avispl.com (+01).866.559.8197

## Table of Contents



Follow Us:

## Executive Summary


As utilities, transportation administrations, network operation centers, and public safety centers face ongoing demands for better service, higher security and better response to emergencies, they look to include the latest "smart" technology in their control rooms, including network-based video, an ultra high-resolution video wall, and simplified controls.

We recently asked three industry experts to discuss what factors administrators should consider as they build or remodel a control room.

Gary Werner is the Director of the Mitsubishi USA Data Wall Group. Gregory Fechner is Director of U.S. Government Markets for Crestron. Carlos Lerma is Director of Engineering for the AVI-SPL Control Room Group.

In this white paper, they will offer their views on building a highly effective control room with the latest network, display, audio and control technology.


## What are the advantages of a smart control room?

**Carlos Lerma:** One of the biggest reasons to build or remodel a control room today is to enhance situational awareness. The operators, their supervisors and other stakeholders need to work effectively together, not only to handle day-to-day operations, but to tackle problems and emergencies as they arise.

For our purposes, we can define situational awareness as the ability to comprehend and respond adequately to information coming in from the field. To make that possible, we want to assemble high quality data from a wide range of sources as it is being generated –that is, to be able to answer the question, "What's happening now? in a complete and comprehensive way. Once we do, we want to be able to collaborate effectively in executing a timely response.

**One of the biggest reasons to build or remodel a control room today is to enhance situational awareness.**

Given that need, an intelligent platform consisting of the workstations, network infrastructure, video wall and simplified controls is paramount for the operators' success. The video wall is a crucial tool, because it allows everyone to monitor and share key information in real time.

## What information sources are typically shared in a control room?

**Gary Werner:** The information operators will need can come from a very wide variety of sources, from remote meters and controls to SCADA systems to surveillance cameras and even public news and weather sources.

As technology designers and integrators, we need a list of everything that's available to the operators, even content that you may not expect to display on the video wall.

Too many times, we have finalized an installation and the question pops up, where is the lightening computer? That can easily happen because it was left off the list or no one mentioned it during the design process.

How we can access each source – whether it's via the network, a direct input, or from a web browser– is also important, so we can get the right signal and present it to the right people.

In utilities, available content will typically include output from SCADA applications, outage management systems, energy management software, geographical information systems (GIS), and dispatch, plus information required for regulatory compliance. We will want to monitor weather channels and lightening computers as well, since weather can have a direct effect on operations.

Transportation usually involves streaming video from a large number of cameras and

may also include input from various types of traffic volume sensors as well as signal controls and control of dynamic message signs.  Rail operations have track control, power, monitoring, and security applications as well.

Fusion Centers bring together police, fire and security personnel in one room so they can collaborate during emergency situations. They tend to have a wide variety of content available to them, including video feeds, sometimes audio feeds such as gunshot detection systems, asset management applications like Web EOC, traffic management software, fire and police communications, and inputs from the field from smart phones, tablets and laptops for real time viewing and analysis.

Private security centers are typically heavy with video feeds and access control applications, and they may include facial recognition software and various video analytics.

Process control is heavy on SCADA applications, with some real time video and material management software.

Once the inputs are determined and prioritized, we can help you create sensible video wall layouts with the following in mind:  What goes where during normal operations? What sources should be displayed during an emergency? Who decides when it's time to override the standard layouts, or are they overridden automatically?

We do have a finite canvas to work with, but since the display wall is dynamic, we can easily switch to different layouts and drill down into the different data fields as needed.

It's important to understand that the information must be pertinent to the situation at hand for all users and supervisors, not just one or two operators. The main advantage of the video wall is that it brings information together from the various operators' workstations plus additional sources that no one may be actively monitoring. It enhances collaboration in what should be a highly collaborative environment.

## What are the network and control requirements for a smart control room?

**Gregory Fechner:** Every room and every situation is unique, but there are a few consistent factors to consider.

First, as control room technology designers, we must understand the content and the sources. How do you want them displayed on the operator workstations and video wall in any given situation? What are their native resolutions?  Is there a requirement for high definition or for 4K video?

We also need to know if you will securely stream information to overflow rooms or to other control centers.  Securely sharing information to others who need it, in as many ways as possible, is an important consideration in the design of these types of facilities.

With all that in hand, we can start to design a switching and distribution infrastructure based on your requirements, one that will accommodates a wide range of sources, connection types and resolutions.

One of the most critical factors is an appropriate, intuitive user interface for the video wall and for the routing of sources to the wall and to the operator workstations. Very likely this interface will include presets on a touch screen for any given scenario, so the proper information can be routed to the video wall as needed, in a layout appropriate for each type of event.

**Ultimately getting that alert or alarm from the field, then putting the appropriate information onscreen in the format the operators are familiar with is crucial.**

Should there be an emergency, the most appropriate information sources and an easy-to-understand layout can be chosen quickly by the operators or a supervisor, or it can automatically appear on the video wall, so that operators can ascertain the situation without delay and take appropriate measures.

**Carlos Lerma:** Here's an example. Let's say we have a network operation center and the video wall displays a map of all the network switches and other important devices, as well as the firewall status. To aid in situational awareness, all of the devices that are working properly are shown in green, while devices that show problems that may slow down traffic appear in red.

In a network environment, SNMP, the Simple Network Management Protocol, polls various devices and will send messages called SNMP traps if it discovers a problem. We can set up the video wall to display these traps, and even open up a window to a manual that instructs the operators on what to do if, say, a router malfunctions.

In an electrical utility, when a transformer fails, it's going to turn red on a schematic map shown on the video wall, perhaps accompanied by an audio alarm. That will alert operators that they need to reroute the power, for example through a different substation, and in the meantime dispatch a crew to make the repair.

**Gregory Fechner:** Ultimately getting that alert or alarm from the field, then putting the appropriate information onscreen in the format the operators are familiar with is crucial. The operators need to know what is causing the alarm and be able to ascertain as much of the situation as possible, quickly pulling needed information up on the video wall and on their desktops, so they can get to the root of the issue.

**Carlos Lerma:** I should add, too, that every year, as we build and support these control

rooms, we are asking more and more of the organization's network to access the information sources.

Cameras are now encoded into a digital stream and carried on the enterprise network, and once in the control room, we no longer have to code and decode that video before we can display it on the video wall. In many cases, cameras are now monitored by intelligent servers that can detect if something is out of the ordinary. That makes it possible to put out an alarm if there's an obstruction on a highway, an intruder on premises, or an object left in a place where extra objects are not supposed to be. In this way, we can proactively address many situations.

That being said, during the design of the control room, we need to have a lot of communication with the IT manager to make sure that new digital content traversing over their network is properly managed.

**Gregory Fechner:** It's very important to understand that Crestron manufactures a lot of the hardware to accomplish all of this, including DigitalMedia switching systems, control processors, and user touch screens, but a professional integrator must also be involved. Carlos and the AVI-SPL Control Room Group will gather the information and program the systems to specifically meet the needs of the users.

## What are the requirements for the video wall?

**Gary Werner:** Compared to content, network and control issues, the choice of the video wall technology and its layout is relatively easy, given three assumptions.

The first is that we are starting with a blank sheet of paper, that is, that we are able to recommend the best solution for the control room without prior constraints.

The second is that we have an adequate budget available.

The third is that we, as technology designers and integrators, are brought in early in the decision making process. The fact is that the choice of the video wall can affect the setup of the room, the operators' furniture, the lighting, the size and setup of the HVAC system, and other important factors. We literally cannot be brought in too early to help you get a good result.

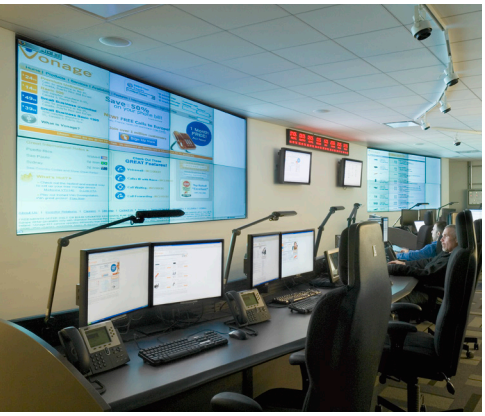
There are three main technologies in use in video walls today. I should mention that Mitsubishi offers all three, and so we are well-positioned in helping you find the best for your application.

A video wall may be made up of flat-panel displays using LCD technology and LED backlights. There can be some confusion in the nomenclature, given that these may be called either LCD or LED displays. The reality is, however, that in all flat-panels, the image is formed by layers of liquid crystal displays, but the light that passes through the LCD pixels and makes them visible is created by an LED-based backlight. Whether called LCD or LED, the technology is the same.

Rear projection cubes use DLP technology with an LED light source. You may have used lamp-based cubes or may still be using them, with the necessity of changing those lamps every year, but lamp technology is obsolete for the control room as our Mitsubishi LED illumination can last up to 100,000 hours or over eleven years of continuous usage.

Making its entry into the market is narrow pixel-pitch, direct view LED, where individual pixels are formed by individual "light emitting diodes." You've seen this technology if you've ever been to a stadium with a video scoreboard, but there the separation between individual LEDs is quite large – roughly one inch from center point to center point in the largest scoreboards. Narrow pixel-pitch displays use a much smaller, tightly-arranged LED matrix to produce the image, today on the order of 1.2mm from center to center.

Ranking these, LCD flat panels are the lowest in cost, with the shortest expected life at about 50,000 hours. Maintainability is an issue, since models change every 12 to 18 months, making it difficult or impossible to find an exact match for a defective unit after a relatively short time. Flat panels are, however, frequently used when space is a constraint and budgets limited, especially if the video wall is needed for only 8 - 16 hours a day.



Direct-view LED is by far the highest in cost with an expected life, depending on the product, of roughly 50,000 – 100,000 hours. That being said, narrow pixel pitch direct-view is still so new that we don't really know for sure. They haven't been around long enough to be tested thoroughly. Then too, there are even larger concerns about parts availability down the road, and manufacturers are recommending that you buy at least 15% of the video wall's area in extra modules and power supplies to be sure you have them when needed.

DLP cubes fall somewhere in the middle in terms of cost, with a lifespan, in Mitsubishi's case, of up to 100,000 hours, which is over 11 years of continuous service. This is a proven technology intended primarily for the control room, and issues with maintenance and spare parts are rare. For those reasons, cubes remain the first choice for nearly all mission-critical control rooms, especially those used 24/7/365.

One of the most frequent sources of confusion we run into has to do with the optimum resolution for the displays that make up the video wall. Because they have high definition televisions in their homes, many people feel that the displays in the control room should each be 1920 x 1080 or better.

Picking the highest resolution possible would make sense if your video wall was made up of only one display, but in a wall made of multiple displays, the overall resolution will nearly always be much higher than "high definition."

Then too, the viewing distance determines the resolution that the operators will actually be able to see. For example, from 25 feet away, it's impossible for the human eye to discern the difference between XGA and full HD in a 46" display.

Thus the optimum resolution can be determined mathematically, using formulas based on viewing distance, pixel pitch and the sizes of the individual displays. The technology, too, can best be determined from the size and layout of your room, its usage, your specific requirements including a need for color accuracy, and any constraints you may have on budget.  These are areas where your design team is in the best position to make a recommendation.

**Carlos Lerma:** That being said, we do generally recommend that our clients make the video wall canvas as large as possible given the room size, viewing distance and budget. Once you start using your video wall, you will almost certainly wish you could include more content: more detail on an outage or other emergency, more cameras, more applications from your SCADA system.

## Choosing an audio system for the control room

**Carlos Lerma:** Sound is important in most control rooms, but sound system design is relatively straightforward. We want clean, intelligible audio and even coverage, making it easy to recognize audio alarms and the spoken word from any position in the control room.

To achieve that, our main concerns are to choose loudspeakers of the appropriate quality, position them according to their dispersion patterns and match the amount of amplification that's required for the number of speakers we need.

## What factors affect the reliability, longevity and total cost of ownership of control room technology?

**Carlos Lerma:** When we start talking about expected lifetimes, we often put the electronics and the infrastructure into separate categories.

Many users expect to refresh their computers and related equipment every five years or less. Upgrading servers and storage can result in significant gains in processing power.

Most want the infrastructure, however, including the cable plant and the switcher, to last 20 years or more. We tend to look at the video wall as part of the infrastructure, since its performance is limited not by processing power, but by the acuity of the human eye. A display that will last 10 years or more with little or no maintenance is thus very attractive.

**Gary Werner:** In order to achieve that long-term quality and reliability, we recommend that you keep some number of spare displays on hand. Although with direct-view LED and flat panels, you will want a relatively large number of extra displays or modules to ensure that you have replacement parts, and even with cubes, if it's a mission-critical control room, we suggest you have one or more extra engines on hand. If you do have a problem, you can replace a DLP engine in the cube in about four minutes, then send the defective unit out for repair.

**Carlos Lerma:** If you want the video wall to go over 10 years, you'll find that cube technology is still the most cost effective.

**Gregory Fechner:** Within the network and switching infrastructure, long-term reliability becomes less of a concern. The most critical applications will run redundant primary/secondary networks, but in many cases that's not needed.

Crestron, for example, uses a chassis-based switcher in our DigitalMedia solution. It's

populated with dual power supplies and individual cards or blades. Should one fail, the rest of the system will continue to work uninterrupted.

Having a card-based chassis also creates flexibility that greatly extends the life of the system. While today you may need video cards for VGA, HDMI, and DisplayPort, the chassis can be completely reconfigured to accommodate future sources, whatever the connection type may turn out to be.

The best control systems, including those from Crestron, will last a decade or more. Once these systems are programmed and set, few if any changes will need to be made. If, however, you decide you need new functionality within your control room, or if you add workstations or video sources, normally you can upgrade the controls through programming.

**Carlos Lerma:** It's important to understand that, when a professional integrator like AVI-SPL designs your control-room technology, we focus on purpose-built equipment that is meant to run in 24/7 environments. While we do occasionally see equipment failure, those failures are nearly always out-of-the-box, often because of issues in their transportation to your site.

Once past their 30-day burn in period, these components are extremely reliable. We have control rooms that we built 15 years ago, still using the Mitsubishi and Crestron products we originally installed.

Obviously you need to hire a professional designer and integrator that specializes in control room applications, but if you choose wisely, that is the level of quality and support you can expect.

**To learn more about smart control rooms, contact AVI-SPL at our toll-free number 866-559-8197, email us at sales@avispl.com, or visit http://www.avispl.com/solutions/command-control/.**

## About AVI-SPL

AVI-SPL is the world's leading integrator of communication and collaboration solutions that support organizations of all types. Our certified engineers design, build, and integrate systems for video collaboration, digital signage, 3D visualization, AV distribution, and intelligent building control.

We also provide a wide range of remote and onsite support services, including cloud-based video conferencing.

We have nearly 40 offices across the United States, Canada, the United Kingdom, and the UAE, as well as an international network of solution providers in 30 other countries.

**Corporate Headquarters:**
AVI-SPL
6301 Benjamin Road, Suite 101
Tampa, FL 33634

## About the Sponsors

**Mitsubishi**
Mitsubishi Electric is a global leader for command and control display wall products, with a wide variety of rear-projection DLP display wall cubes and LCD display wall panels.

**Crestron**
For more than 40 years, Crestron has been the world's leading manufacturer of advanced control and automation systems. Our solutions are built on a validated architecture, using best-in-class technology that integrates unified communications, AV presentation, lighting, and environmental systems.