

INTEGRATED EMERGENCY RESPONSE

*New tools and tactics for the modern
emergency operations center*

By Don Kreski





E

xtrême weather, fire, and earthquakes can be costly and tragic realities. The right technology—properly integrated—can significantly improve preparedness and response.

“Something happens—a fire, an earthquake or a hurricane—and they wake you up in the middle of the night: ‘We’ve got 500,000 people we need to evacuate. Where do you want them to go?’”

That’s a question Richard Hinrichs, Ph.D., managing director of Disaster Services for the American Red Cross in San Diego, has been asked more than once. It’s a tough question.

“We need to move the victims to safe locations. We need to provide food, water, electricity, and volunteers. We have a tremendous amount of information to coordinate from police, fire, medical centers, the National Guard, utilities, weather services, local governments, and other Red Cross chapters,” he says.

According to Hinrichs, the high-tech systems in the new San Diego Chapter Disaster Operations Center (CDOC), used recently for Hurricane Sandy relief, has dramatically cut the time needed to start up a response to a major disaster. At the heart of the center is a new concept in emergency planning—the ‘Common Operating Picture’—and a sophisticated technology suite developed, in part, by San Diego AV integrator Fluid Sound.

EXPECTING THE UNEXPECTED

“People are not good at making decisions based on tables of statistics, so we put everything into a highly visual format based on a map of the impacted area and what we know about it right now”



(Left) The TouchTable in the San Diego San Diego Chapter Disaster Operations Center (CDOC) provides a collaborative mapping environment shared with chapters and partners at remote locations. A streaming setup provided by AV integrator Fluid Sound makes it possible for partners who do not have TouchTables to view high-definition output from this device. (Above) The conference area has its own AV and videoconferencing systems, yet is not physically separate from the main room of the CDOC. The innovative setup of the Crestron DigitalMedia network and a BSS/Panphonics-based audio system make this practical.

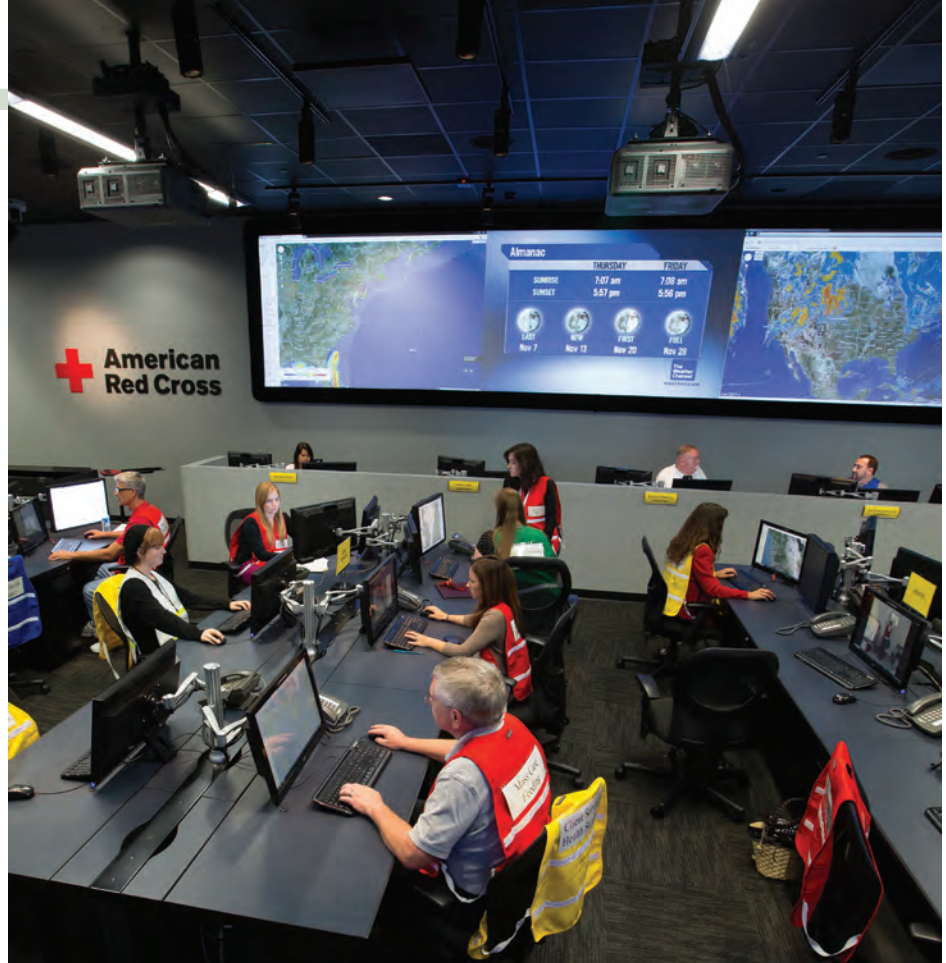
Hinrichs says. SitCell, a new software program developed by the Red Cross and San Diego State University, creates this multi-layered picture, and an innovative AV system brings it to Red Cross staff, volunteers, and partners.

The most striking component of this AV system is a new TouchTable, a collaborative mapping device with a 46in. diagonal touch-sensitive LCD work surface. Designed to interact with other TouchTables and PCs with TouchTable software, the device allows users at distant locations to simultaneously manipulate maps and to export them to SitCell and other applications.

One issue with the TouchTable is that “it was obvious that the Red Cross would not have the budget to put TouchTables or even TouchTable software in partners’ facilities, at least not right away. One of our priorities was to create a method for outside agencies to view TouchTable output in realtime, even if they were not able to manipulate it,” says Dennis Pappenfus, CTS-D, partner at Fluid Sound.

Part of the solution was a sophisticated video and audio mixing matrix that allows users to move any signal from any connected device in the center to any other—as well as to partners working outside the CDOC.

The TouchTable has three digital video outputs. One carries the map being manipulated, while the second and third carry images captured from these maps. Fluid Sound connected each of these outputs to a Crestron DigitalMedia 32x32 digital matrix switcher using HDMI cables. From the switcher, users can route these outputs, or any other computer or video source in the CDOC, to any of six large-screen displays



Red Cross crisis teams in San Diego used the CDOC recently in Hurricane Sandy relief. Members of each team, who sit at a long computer work island, can commandeer one or more of the six large-screen displays for their own use or to make presentations to other teams. A unique room-combining system allows each team to listen to their own program or voice audio, yet the sound is inaudible to other teams just a few feet away.

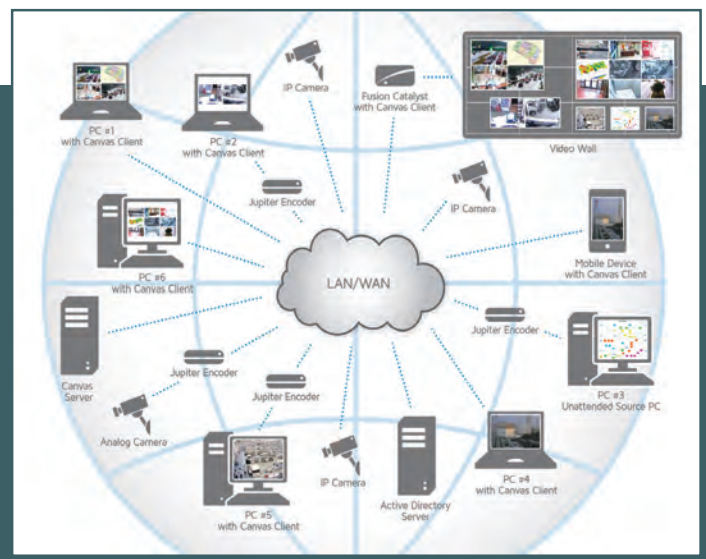
plays including three NEC PX750U projectors at the front of the center’s main room and three 55in. NEC P551 LCD displays at the back.

To reach partners outside the center, Pappenfus’ team connected outputs from the DM switcher to three Marshall VS-102-HDI IP broadcast encoders, which stream video

and audio to a server on the Red Cross content delivery network (CDN). “In this way, anyone with the proper credentials and an Internet connection can view 1080p video and audio streaming in realtime from the TouchTable and other devices in the center,” he explains.

New Tool

Jupiter Systems Canvas visualization and collaboration tool allows users in a facility, across a campus, and around the world to see, share, annotate, and collaborate on secure video and desktop streams. Canvas allows authorized users to receive a captured stream or “canvas” to any PC or mobile device. They can use their finger to annotate directly onto the moving video or type onto it. All of these annotations can be seen by other authorized users—effectively turning individuals personal devices into networked video display walls. A canvas can include a source viewer for video and desktop streams, a grid for organizing objects, a label that can have dynamic properties and display data from network sources, and a frame that can include a title. A toolkit allows other widgets to be custom made by Jupiter, the integrator, or end-user. Canvas provides object-level security for all sources and role-based security architecture, and supports Windows Single Sign-On (SSO). —Cynthia Wisehart



Fluid Sound also routed an output from the DM switcher into a Polycom HDX 9000 Series videoconferencing system, which the Red Cross uses for two-way communications with other chapters and partners.

ROOM-COMBINING WITHIN ONE ROOM

Another challenge Pappenfus faced was a need

to provide a degree of flexibility far beyond anything in an ordinary meeting center.

Much of the work during a crisis is done by staff members grouped at four work islands or around a conference table in the main room of the CDOC. Workgroup members can share files with each other via the computer network, the group leader can take over one of the large-screen displays as they work, or they can use one or more displays to share material with

another team or the whole center during a crisis. The CDOC is designed, in fact, to be used for multiple simultaneous crises, and each of the workgroups can function independently or combine in various ways with other groups.

“What makes this possible, on the one hand, is the Crestron AV switching system, but there’s also a room-combining audio system that isolates the sound from workstation to workstation—even though there are no walls separating them,” Pappenfus explains.

The first part of this audio system is straightforward: Program audio from the Crestron switcher plus audio-only sources feed into a BSS Soundweb London BLU-160 digital signal processor programmed for room-combining. “We have six discrete zones of audio,” Pappenfus says, “the room as a whole, the four work islands, and the conference table.”

Next, Fluid Sound technicians created cross-overs in the DSP that isolate the frequencies used by the human voice, then feed them into highly directional Panphonic ‘Sound Shower’ ceiling speakers mounted above each work area. Because there are no low tones, the resulting audio is hyperdirectional, allowing workers in one area to listen to voice communications from a microphone, teleconference, radio, or a TV news feed while others—sitting just a few feet away—can’t hear them at all. “The system would be terrible for listening to music,” Pappenfus notes, “but that’s not its job.” A sound-masking system muffles the voices of those speaking at any distance, helping each workgroup focus on the task at hand.

IPAD CONTROL AND EOC

When Santa Barbara County took its Emergency Operations Center (EOC) from a 1600-square-foot trailer with one projector and a small TV to an 11,000-square-foot building with several technology-enabled spaces, Electrosonic provided audio, video, and data information support plus videoconferencing and streaming video capabilities.

A centerpiece—and a challenge—to the design was the role of iPad-based control as envisioned by The Sextant Group. The implementation of this particular innovation pushed the use of the Crestron iPad app into new territory, says Electrosonic Project Manager Jeff Galatro, Sr. Five mobile tablet devices, operating on the building’s secure Wi-Fi network allow the EOC to control the majority of its systems. The tablet not only controls all AV components throughout the EOC—including displays, videoconferencing, PTZ camera, and digital signage—it also retains all standard iPad functionality, including web browsing, and can be used as a source by plugging into the various facility displays.



The iPad devices also serve as interface to the Media Distribution System. As the primary head-end for the AV system throughout the facility, it includes sources such as direct broadcast satellite, off-air antenna, cable television, DVD player, OFCI WEBEOC feeds, and videoconferencing codecs. The distribution system allows any source to be viewed from any location’s display or PC via a full Haivision Furnace system.

Galatro explains that the key was running separate incidents of the Crestron software for each iPad to avoid collision and latency. Each iPad can operate simultaneously; each can control any aspect of any of the room systems without stepping on each other. Interlock is used only to assign dedicated videoconferencing codecs to any of the five rooms.

Galatro credits Crestron programmer Oliver Pemberton with coming up with a system for running the five instances of the operating system. In fact, the system has now scaled to accommodate five more instances via the web browser, and can in theory scale to accommodate as many devices as desired. Galatro says his team worked closely with the county IT department to resolve security issues to allow the iPads to operate over the network.

“Because these devices are used by consumers—and integrated with Apple products like Airport and Apple TV, there’s an idea that they’re plug-and-play. This is most definitely not the case,” Galatro says, adding that his preference is to also include a fixed Crestron panel on a dedicated network as a backup. However, the cost benefits, flexibility, and user preference for mobile devices suggest that finding ways to integrate them with commercial systems and software can be worth the effort. “In our world, an iPad is only as good as the programmer and the hardware engineer.”

—Cynthia Wisehart

VIDEO PROCESSING, VIDEO CAPTURE, AND SIMPLIFIED CONTROL

The innovative design work did not stop with these systems. Although there are only six large-screen displays, staff can use them to monitor up to 12 video and computer feeds via two Crestron DVPHD multi-window video processors, which also give them the ability to annotate live or freeze-frame video. “Someone might freeze an image from the news or the TouchTable showing a fire line, write notes on it, send it to SitCell, and show it on one or more of the displays,” Pappenfus explains.

The chapter is also able to create full 1080p video press releases using a Crestron Capture

HD coupled with an automated Sony camera. To use this setup, a spokesperson would typically assemble maps or graphics from SitCell and video from the field into a presentation on a computer. Then, at the touch of a button, he or she can begin recording, explaining the situation while switching back and forth from a 'talking head' to the video and graphics. "Once they've captured their message, they can move it to a server for partner access or push it out to the news media, all without the need for a production crew," Pappenfus explains.

The final step in creating the CDOC technology was designing a simple way to operate it without confusion during a crisis. To do so, Fluid Sound used a large, 24in. Crestron V-Panel coupled with a Crestron processor and DGE-2 graphics engine. "Because we drive high-definition preview images to the touchscreen, users with little or no training can route images from any source to any output."



Analysts monitor news broadcasts in an unfolding crisis. This space is separate from the main room of the CDOC, yet is tied in through the Crestron DigitalMedia and computer networks.

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HURRICANE SANDY

Although major crises are relatively rare, the CDOC is used on a daily basis. "We take part in roughly 300 operations each year, most involving only a handful of people," Hinrichs says. Because Red Cross chapters share personnel and other resources in any large emergency, the CDOC was used throughout the Hurricane Sandy efforts.

The Red Cross used the center to track the path of the storm and, after it made landfall, to produce maps of the affected area based on data from several sources that included FEMA, the State of New York, local governments, and other agencies. According to Andy

McKellar, director of Disaster Services for the American Red Cross San Diego/Imperial Counties, the chapter created a multi-layered map of area hospitals, power outage information, shelter locations, fixed feeding sites, food distribution sites, and realtime local traffic conditions, and was able to produce mapping products to share with partner agencies.

"Over the past few months," McKellar explains, "the CDOC and SitCel have proven to be very effective tools. In response to several localized wildfires, we were able to select shelter locations and deploy material and personnel far faster than in the past. In one instance, for the Shockey Fire in rural eastern San Diego County,

we were able to set up a shelter at the local high school in about 30 minutes. Before the advent of

Although major crises are relatively rare, the CDOC is used on a daily basis.

these systems, it would have taken us approximately two hours to accomplish the same task."

"We're excited about the place," Hinrichs adds. "It has moved us forward light years in our ability to handle an emergency."

HDCP AND EDCS

This AV installation at the Minneapolis Emergency Training Operations Training Center helps meet the training and response needs of the Minneapolis Fire Department, the Minneapolis Police Department, and the city's Emergency Management services, along with other regional partners. AVI-SPL designed the system to facilitate collaboration and allow departments to quickly share time-sensitive information. This includes both internal information and a multitude of external sources including many with High Definition Content Protection (HDCP).

One key reason for the use of Crestron DigitalMedia on this installation was the city's reliance on consumer broadcast services and the media for communications. It was critical that the system be HDCP compliant across the range of sources and display devices, and the HDCP management has been the cornerstone of DigitalMedia from its inception.

Gary Pehl, lead engineer on the project for AVI-SPL says this installation was an example of a growing reality—consumer media and consumer devices create cost, feature, and expectation pressures on commercial systems. That means coping with the shifting sands of HDCP compliance (and other consumer-driven elements) in a commercial-grade way. Once you accept that, Pehl says, the obstacles start to look like opportunities.

"Robust, functional, useful systems are harder than ever to design—that's a huge value we can add," he says. "End-user experience is greatly enhanced as end-users become more technology literate, and our systems effectively support and satisfy their expectations."

Regarding the EOTF specifically, access to locally generated informatics is done through computer—maps, GIS, BIS, shot spotting software, and dispatch utilities, as is typical in such settings. But commercial television is also critical—local and national news is absolutely indispensable via cable television, satellite television, and internet.

"Crestron saw this marriage of consumer and commercial coming together and marshaled the full capacity of their resources towards mastering this landscape," Pehl says. Pehl says that Crestron's comprehensive support system—both in the interest of project success and in advancing their own mastery—has been an important factor. It translates to three years of accumulated knowledge in handling varied and evolving consumer standards, devices, and protocols.

A few examples off the top of his head? "Hot Plug," he says. That's when the source provides power to the sink to enable communication even when the sync is not directly powered—a protocol that is not always implemented correctly, which can cause an unpredictable response by the source. In addition he says, not all displays accept all resolutions on all inputs, which often results in a really incomprehensible, and effectively failed, end-user experience. From his viewpoint, the glue that made it possible to have a secure, stable system that blends in protected consumer content and consumer device was CrestronDM and the support that goes with it

—Cynthia Wisheart

