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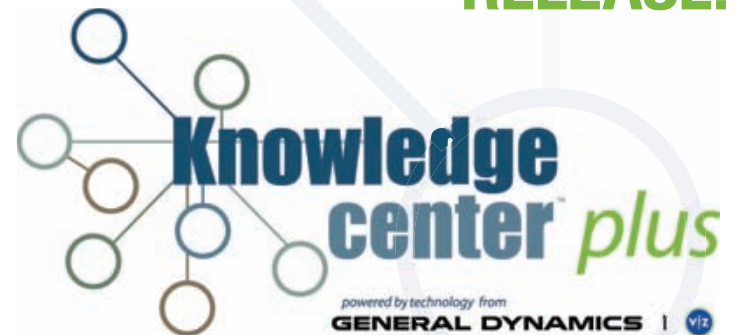
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A New World

Ten years from now, the world of public safety will look like what's on TV today.

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California EMS agencies pilot solutions with health information exchanges.

A large curved banner at the top of the image features the AT&T globe logo on the left and the text "Global Network Operations Center" in a white, sans-serif font. The background of the banner is a dark space scene with a view of Earth from space and several bright stars.

Global Network Operations Center

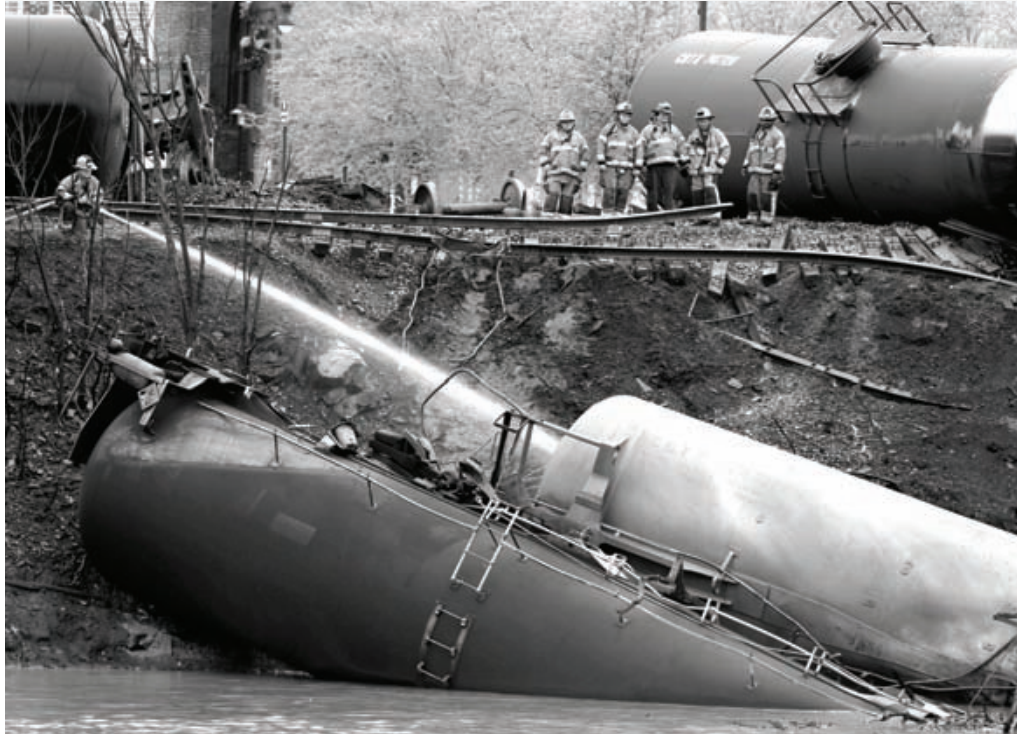
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Emergency Management (ISSN 2156-2490) is published quarterly by e.Republic Inc. 100 Blue Ravine Road, Folsom, CA 95630. Periodicals Postage paid at Folsom, CA and additional offices. Postmaster: Send address changes to *Emergency Management* 100 Blue Ravine Road, Folsom, CA 95630. © 2016 by e.Republic Inc. All rights reserved. Opinions expressed by writers are not necessarily those of the publisher or editors.

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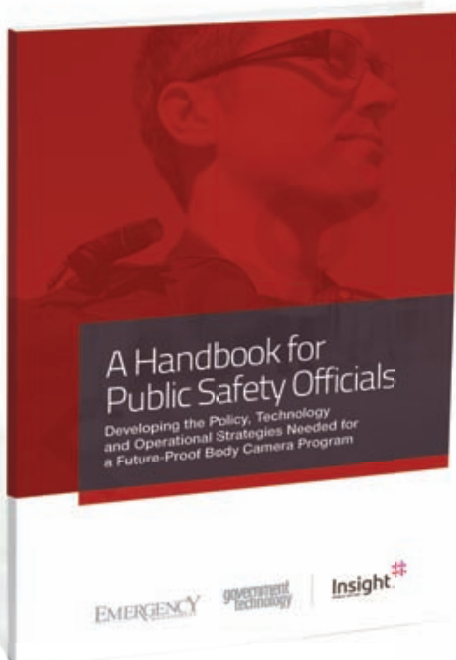
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Thinking about implementing a body-worn camera program?

Join the one-third of public safety agencies nationwide that are actively planning or have already implemented an initiative. Many are already starting to see positive results:

- ✓ In a year-long experiment, the Rialto, Calif. Police Department saw a **60 percent drop in use-of-force incidents**, and **complaints about officer conduct declined by nearly 90 percent**.
- ✓ In Phoenix, information from officers suggested a number of citizen **complaints were not pursued** because the incident was recorded on video.



Before you begin, your agency needs to carefully consider the policy, technology infrastructure and operational decisions necessary for an effective program. A new *Emergency Management and Government Technology* handbook, underwritten by Insight Public Sector, focuses on the interplay of body camera policies with technology and operational strategies to help agencies future-proof their body-worn camera initiatives.

Read the handbook to:

- ✓ Discover key planning questions agencies should consider
- ✓ Learn insights from agencies initiating their own programs
- ✓ Find checklists and resources to help further an agency's exploration in each planning area

Download the handbook now at:

www.emergencymgmt.com/body-camera-handbook



My criticism [to the article *Is 'Pretty Good' Enough?*] is the statement that, "Sometimes the state approves a road, the county builds it, the road goes bad and FEMA again denies the claim."

The source would like to see FEMA take responsibility for allowing a jurisdiction to build a road or any infrastructure where a jurisdiction knowingly approves a project that will be doomed because it would be built, as in this scenario of a flood plain. Why should FEMA be liable? Local governments, like the federal government, must assume responsibility for what they know to be what is right. It's called ethics. Does FEMA need reform? Yes, stop using this most important arm of the Department of Homeland Security as political payback.
Frank Gonzalez — in response to *Is 'Pretty Good' Enough?* in the Fall 2015 issue

The comment that ICS was not designed for large disasters is completely wrong. The 1970 wildfires were the catalyst for ICS because they were a disaster. It was the fact that it was a disaster that made the emergency response procedures ineffective.

The comment, "It was reported that many working the oil spill were unfamiliar with ICS" is not a fault of ICS but of the people. I believe that is where many of the challenges lie. There is no question that poorly understood ICS will be a poorly implemented ICS.

ICS that teaches the org chart is sure to fail. Yes, there was a military component

to the creation of ICS (Napoleon's use of Span of Control) but it was a business guru who brought us Management By Objectives. Peter Drucker first taught and then described the technique in the book *The Practice of Management* in 1954.

Tom Cox — in response to *Is 'Pretty Good' Enough?* in the Fall 2015 issue

"What is the value proposition or return on investment? For individuals, it is an investment in adaptive safety and security. For the government, it saves lives and property. For businesses, it protects the bottom line and sharpens their competitive advantage." I agree with this commentary. It is very difficult to quantify vulnerability, much less find common agreement of a

definition for vulnerability or "resilience." I think of your concept in terms of coping capacity from the micro- to the macro-socio-economic political systems. Using the effort of a community or organization to focus its energies and resources on enhancing its mitigation framework represent my (ROI and/or VP) and potential decrease in vulnerabilities and better ability to manage risk. Same idea/concept, but with a different worldview.

The more interconnected our technologies become the more unpredictable the variables for human-made/adversarial occurrences. I think your perspective is on point and that your narrative is very much in keeping with the asymmetric threats to critical infrastructure and key resources and lives posed by the future proliferation of UAVs.

Michael Brown — in response to *Value Proposition of Resilience* in the Fall 2015 issue

Good stuff! I appreciate how in the final paragraph, you put the benefits of resilience in the language of the individual, government and business. Resilience can be/should be a unifying theme that all sectors can get behind.

John Contestabile — in response to *Value Proposition of Resilience* in the Fall 2015 issue



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By Jim McKay

Welcome to the Future

In this first issue of the year we look at how public safety and emergency response has evolved and what it could look like in a decade.

I've learned not to try to predict the future, especially when it comes to public safety and technology, but we're on the verge of some breakthroughs, or so it appears. How many times have we heard, though, that it's not a technology problem?

WHEN WE LOOK AT THE FUTURE OF PUBLIC SAFETY, THERE'S A LOT THAT CAN BE DONE TO MAKE THINGS SAFER AND MORE EFFECTIVE.

Some of the potential gadgets that might accompany the futuristic suit are pretty impressive, including:

- Puncture-detection sensors woven into fabric, so that if an officer is shot, a 911 call will go out automatically;
- A range of fabrics that generate electricity by the body's own movements, keeping devices at the ready without the need to haul extra batteries and chargers;
- A mouth guard that serves as a communication device, using bone conduction to channel signals through the teeth and jawbone, conveying sound even in a noisy environment; and
- Wireless camera and video capabilities built into eyewear.

It's fascinating stuff, and it could be on the verge of reality. Of course there are problems involved, and you'll learn of what the roadblocks are to a much safer, effective public safety.

Law enforcement is on feverish pace to get on the video surge, as you'll read in the feature *Opportunities, Burdens*. As the headline suggests, the proliferation of video presents a multitude of opportunities for public safety, as well as some headaches.

After a riot erupted following the Stanley Cup hockey final in 2011, the Vancouver police found themselves sifting through 5,000 hours of video footage to try to answer the public's call for justice. And with the advent of body-worn cameras for law enforcement, the relevance of video is ramping up. How will public safety manage it all?

We at *Emergency Management* are excited about 2016 and the evolution of public safety and emergency management. We hope you continue to follow it with us this year and beyond. +

Over the last decade or so when discussing interoperability, that's been a familiar refrain and a true one. When we look at the future of public safety, there's a lot that can be done to make things safer and more effective, and the technology exists to make it happen.

Interoperability is a critical issue, but operability is still an issue too. When you read the cover story on public safety, *A New World*, you'll hear a fire chief talk about how sometimes he just wants to know where his people are. Where have we heard that before? It's simple operability. We learn from this story that the solution could one day be embedded into a futuristic fire suit, one equipped not only with the ability to physically monitor and protect the human inside, but also to communicate effectively with those outside the scene.

AN AWARD-WINNING PUBLICATION



QUESTIONS OR COMMENTS?

PLEASE GIVE US YOUR INPUT BY CONTACTING OUR EDITORIAL DEPARTMENT AT EDITORIAL@EMERGENCYMGMT.COM, OR VISIT OUR WEBSITE AT WWW.EMERGENCYMGMT.COM.

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+ In the News

An EF4 classified tornado tore through Garland, Texas, on Dec. 27, 2015, killing eight people with winds up to 200 mph. The tornado was one of two in Texas that day that killed a total of 11 people, including a baby.





SINCE THE DEADLY SNOWSTORM, NEW YORK HAS SPENT \$50 MILLION ON A NEW FLEET OF SNOW REMOVAL EQUIPMENT.

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BUFFALO BEEFS UP PLANNING IN RESPONSE TO 2014 ‘SNOWEMBER’

It has been a year since the 2014 “Snowember” blizzard that buried parts of Buffalo, N.Y., in up to seven feet of snow and resulted in 14 deaths. In response to that disaster, Buffalo’s Office of Homeland Security/Emergency Management (OHS/EM) has taken substantial steps to be much better prepared.

Miscommunication or resistance interfered with efforts to clear streets, and town officials complained that the county failed to send plows where they were most urgently needed.

Erie County Executive Mark Poloncarz countered that town officials refused to make use of a computer-based system to coordinate the response of crews and also didn’t take part in daily conference calls.

So what went wrong? According to OHS/EM Commissioner Garnell Whitfield, Buffalo and the surrounding county were “overwhelmed” by the sheer scale of this “once in a century” snow emergency. After all, it did dump up to seven feet of snow in parts of the city over seven days. “We have a lot of new equipment and new strategies going forward,” he said.

The emergency response to this massive snow-

fall was exacerbated by snow equipment requests to other counties and the state not being fulfilled as quickly as city and county officials needed them to be. Coordinating rescue and relief activities was also tremendously difficult in snow-buried sections, as was managing the safety of hospitals in particular and residents in general.

Many lessons were learned as a result of the storm and its attendant loss of life. Some of these were addressed by New York Gov. Andrew Cuomo’s NY Responds initiative in August 2015. Under this program, New York is giving all 62 counties in the state free access to Buffalo Computer Graphics’ crisis information management software, so that the “miscommunication” that occurred in Buffalo during Snowember doesn’t happen again.

The state has also spent \$50 million to buy a new fleet of plow trucks, loaders, graders and dump trucks that will be shared by all 62 counties as needed. Should Buffalo get hit by another seven feet of snowfall (or less), there will be much more snow removal equipment available to help out.



‘Unspeakable Sights’ Take Toll

One of the first responders on scene at the San Bernardino, Calif., terrorist attack — where 14 people were killed and dozens more wounded — called what he saw “unspeakable.”

Often those experiences can haunt first responders, but those who assist others might not seek help in coping with tragedy themselves.

In 2015, 112 first responders committed suicide, according to the Firefighter Behavioral Health Alliance, a nonprofit that calls itself the only organization that tracks suicides among firefighters and EMS personnel.

TRIBUNE NEWS SERVICE

NY STATE TERROR APP

In response to the murderous Paris attacks by the terrorist group ISIS, New York State Police are promoting a new digital app that allows citizens to capture and report suspicious activity with the touch of a finger on their smartphones.

The app is part of the “See Something, Send Something” campaign that encourages citizens to be the eyes and ears of law enforcement when they see someone abandon a package or a bag at airports or train stations, or witness other suspicious activity.

TRIBUNE NEWS SERVICE

DEATH FROM TERRORISM?

Comparing the CDC numbers of other causes of death in the United States to terrorism deaths worldwide:

35,079x

You are 35,079 times more likely to die from **heart disease** than from a terrorist attack.

33,842x

You are 33,842 times more likely to die from **cancer** than from a terrorist attack.



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A photograph of a residential street that has been completely flooded. In the foreground, a white speed limit sign with black text reads "SPEED LIMIT 20". The sign is partially submerged in the brown floodwater. In the background, a dark brown house with white window frames and a porch is visible, also surrounded by water. A green bush is on the right side of the frame.

SPEED
LIMIT
20

Don't Wait.

A photograph of a woman with long dark hair, a young girl, and a young boy sitting on a green lawn. The woman is on the left, wearing a red sleeveless top and blue jeans, and is gesturing with her hands as if talking. The girl is in the middle, wearing a light-colored patterned top and blue shorts. The boy is on the right, wearing a light blue patterned t-shirt and blue shorts, and is holding a soccer ball. A golden retriever is lying on the grass to the left of the woman. The background is filled with lush green foliage.

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FEMA

A NEW WORLD

Ten years from now, the world of public safety will look like what's on TV today.

By Adam Stone

Manuel Navarro has a relatively simple request. He would just like to know: Where is everybody? “For years we’ve talked about knowing precisely where our firefighters are within an incident, and no one has come up with the best way to do that,” said Navarro, a division chief in the Menlo Park, Calif., fire department. He also serves on the technology council of the International Association of Fire Chiefs. “We go on the radio and say, ‘Do you have all your people?’ But we don’t know where those people are. They may not know it themselves. For us, that is a massive safety issue.”

For years technology has been promising to fix the issue but, like many in the first responder community, Navarro has been less than impressed. “Just about every firefighter has an iPad,” he said. “But if I get to an active incident and you have your nose down in the computer not watching what is going on, I’m going to be talking to you later. You aren’t there to take pictures and take notes.”

Now technology is taking a new turn. Supported by the U.S. Department of Homeland Security (DHS), the high-tech community has begun developing a new generation of devices that go far beyond laptops and tablets.

Referred to generally as the Internet of Things, the new wearable technologies integrate into firefighters’ existing suits, making available a range of sensors that can deliver vital data on the status of a rescuer in the midst of an unfolding event. Observers say the new wearables could dramatically alter the face of firefighting.

The Possibilities

The catalog of wearables is growing fast, in part because this is an industry still very much in its infancy, one dominated by small startups. These devices are still finding their feet in the mainstream market and even more tentatively among emergency responders. Still, early offerings give a sense of where things are headed. Some of these include:

- puncture-detection sensors woven into fabric, so that if an officer is shot, a 911 call would go out automatically;



- a range of fabrics that generate electricity by the body's own movements, keeping devices at the ready without the need to haul extra batteries and chargers;
- a mouth guard that serves as a communication device, using bone conduction to channel signals through the teeth and jawbone, conveying sound even in a noisy environment; and
- wireless camera and video capabilities built into eyewear.

One good example comes from CyberTimez, a Washington, D.C., company working on a solution to Navarro's longstanding lament, that is, knowing a firefighter's location. The company's Cyber Trackz device, which should go to market this year, follows a rescuer's trail in much the same way consumer exercise wearables help fitness buffs count their steps.

"Right now there are a lot of people [tracking location] from the outside in, using GPS, Wi-Fi or Bluetooth triangulation where beacons and sensors have to be dropped, and even then they can only determine where someone might be," said CyberTimez CEO and co-founder Sean Tibbetts. By having the wearer passively broadcast location data, Cyber Trackz aims to make things simpler and more accurate.

Interestingly, the company did not start out in the emergency response business. In fact, its location tracking technology came to life as a means to help the disabled find their way home should they become lost or confused. This is a driving trend within firefighter wearables, this migration from the consumer space into the emergency realm.

Market Matters

There's a market logic here that makes good business sense, but that has also worked against emergency responders' ability to gain timely access to these tools.

The firefighting community is tremendous — some 30,000 fire departments according to the National Fire Protection Association. That's a potential market of 1,140,750 firefighters — a hearty audience for anyone looking to augment the standard uniform with a helpful new piece of technology.

But there's a snag. This market is wildly fragmented. Each department is an island, operating largely on its own and purchasing

for itself from its own budget. For an entrepreneur this makes market entry logistically difficult, to say the least. There's no central entry point, no consolidated way to reach out to all those potential customers.

Even if there were an easy way in, many entrepreneurs still would be wary of trying to introduce technology into a field that basically hasn't changed the way it operates in the past 150 or so years.

Finally, even among entrepreneurs whose tools could greatly benefit emergency responders, the needs of firefighters are just not very strong on the radar. Dating sites? Absolutely. Taxi apps? Sure. "Entrepreneurs tend to solve the problems that they see, and first responder issues are not generally the problems that they are sitting around thinking about," said Brendan Karp, who heads the Chicago venture capital firm TechNexus.

Karp has been helping to shift that mindset in recent months, as a partner in an ambitious wearables initiative led by the DHS.

DHS Steps In

Start asking around about firefighters and the Internet of Things and you will very quickly run into the name Robert Griffin. As DHS deputy undersecretary for science and technology, as well as a former fire chief with 20 years in local government, Griffin has drawn from his own experience to bring DHS leadership to local firehouses. "Everything that I do comes from the field," he said.

Why would the DHS concern itself with the local fire department? As Griffin sees it, it's all a continuum. Local security impacts the city, which influences the state, which drives the nation. "Homeland security is really about community security," he said.

Griffin admits to thinking wearables were just a fad at first, but his mindset has come around and he now describes a range of ways in which the new tools could have helped him do his job out in the field, and could help others today.

Wouldn't it be great, he said, if commanders could track the health and telemetry of firefighters in the heat of the fight, monitoring the well-being of rescuers even when those rescuers could be neither seen nor heard by conventional means? Or if they could have inexpensive, real-time





WIRELESS CAMERA

and video capabilities built into eyewear



TOOLS BEYOND INFRARED

to pick up a heartbeat or other sign of life from a child who's hidden in a closet or under the stairs



A MOUTH GUARD

that serves as a communication device, using bone conduction to channel signals through the teeth and jaw bone, conveying sound even in a noisy environment



MONITOR FOR TRACKING HEALTH

and telemetry of firefighters in the heat of the fight



PUNCTURE-DETECTION

sensors woven into fabric, so that if a first responder is shot, a 911 call would go out automatically



A RANGE OF FABRICS

that generate electricity by the body's own movements, keeping devices at the ready without the need to haul extra batteries and chargers



TRACKING LOCATION

from the outside in, using GPS, Wi-Fi or Bluetooth triangulation





The fire suits of the future may use a range of technologies to keep track of a firefighter's well-being and broadcast that data to a command station in real time.

FIRE HELMET CONCEPT BY ÖMER HACIOMEROĞLU

3-D monitoring of an interior space in the midst of a blaze? Or tools that could see beyond the infrared, to pick up a heart-beat or other sign of life from a kid who's hidden in a closet or under the stairs?

All these may well be possible if the entrepreneurial community steps up. Griffin is working with technologists and investors to see that that happens.

Much of that effort comes in the form of the EMERGE wearable technology accelerator program. The initiative aims to attract entrepreneurs whose technologies might benefit the first responder community, including body-worn electronics, advanced sensors, protective equipment and embedded communications systems.

The program has offered mentoring opportunities to more than a dozen firms and held multiple demonstration days, where investors and entrepreneurs have come together to explore what might be possible. Organizers were looking not just for functionality, but also usability.

Tomorrow's fire suit will have to be lean: First responders don't want to have to carry any more than they do today.

With this in mind, the makers of wearables are aiming to produce tools that are convenient, if not outright transparent, to the user. Small and lightweight, many are incorporated directly into the fire suit.

Among EMERGE participants, this included EnergyBionics' energy-harvesting technology built into a watch, a NuCurrent wireless antenna as thin as 0.08 mm and BearTek Bluetooth-enabled gloves that let the wearer operate electronic devices.

In the effort to identify such products, DHS has teamed up with organizations like the Washington, D.C.-based nonprofit Center for Innovative Technology (CIT), which helped pull together the September 2015 Demonstration Day in San Francisco. "People were just blown away by the variety and quality of the companies we were presenting," said David Ihrie, CIT's chief technology officer.

Ihrie said the center will take input from multiple players to get these ideas off the drawing board and out into the hands of firefighters. Maybe FEMA could help by targeting UASI grants and other local spending in support of these technologies. The DHS can help by continuing to bring people together, and perhaps by establishing some forms of testing and certification, in order to ensure interoperability.

"What is an appropriate role for the government, what is an appropriate role for intermediaries like us? We don't



FIRE HELMET CONCEPT BY ÖMER HACIOMEROĞLU

have all the answers yet, but we believe these are all very possible,” Ihrle said.

In the near term, EMERGE organizers would like to see prototypes in the hands of first responders to generate initial feedback. Griffin said that in those tests, companies will have to show not just the technological success of these products but also their market viability. “If we approach this just as a technology challenge, we fail,” he said.

In this case, market viability means in part the ability to smoothly insert that technology into working fire departments. As Griffin noted, commanders can’t just shut down their firehouses for a week or a month to train on a new technology. It has to happen seamlessly — and it has to work flawlessly the first time. At DHS, “we can work with industries to pilot those technologies, to allow them to continue to develop the technology so they have worked the kinks out by the time it is ready for mass release,” said Griffin.

Still, having a great product doesn’t ensure mass acceptance.

Moving Forward

Firefighters are a conservative bunch. They train to be cautious in a rescue situation, and that same sense of prudence sometimes seems to dominate the firehouse mindset. They are rarely early adopters of technology, and it seems unlikely they will race to embrace the new wearables. How to get the new tools into ready hands? Griffin has a few ideas.

- Launch wearables in big fire departments. “People look to L.A., New York and Chicago as the thought leaders. So we start there and then build on that word of mouth,” he said.
- Consider form. Technology is supposed to be sexy, all rounded edges and sleek lines. The right form will help drive adoption. “It has to look like what you see on TV.”
- Hand it out first to urban search-and-rescue and other specialized teams with a keen interest, then let them play. “They take it, they break it, they change it and adapt it, and then

they talk about it in the stations and everybody says, ‘Isn’t that neat?’”

- Skip the chiefs. Bring them in the loop, sure, but don’t expect them to leap out of their seats with excitement. Instead find a 20-year-old to test drive the stuff, then let the technology make its way around the station. “You work with the willing. You find the right person.”

Whether by these or other means, it’s virtually certain that wearables will be part of the firefighting arsenal sooner rather than later. Standard disclaimer for all high-tech stories: No, this is not science fiction.

“The future is coming really fast,” Ihrle said. “If you look at the convergence of the Internet of Things, robotics and artificial intelligence, 10 years from now the world is going to look very different than it does now. Emergency response folks are going to be living in a very different world.” +

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Vancouver police
sorted through 100
hours of VHS tape
after the Stanley
Cup riots in 1994.

A photograph of a city skyline at sunset. The sky is a deep orange and red, with a large, dark plume of smoke or steam rising from the buildings on the right side. The buildings are silhouetted against the bright sky. A small airplane is visible in the upper left portion of the sky.

OPPORTUNITIES,

Video evidence: Continuing developments in



By Margaret Steen

Video evidence collection is changing rapidly, creating immense potential and huge challenges. The technology promises to put more evidence than ever at the fingertips of law enforcement and emergency managers — yet there are significant hurdles to overcome, both technical and political.

Video isn't new, of course, but the quality and quantity of video available have increased dramatically in recent years.

"The fact that there's so much video out there is creating both opportunities and burdens," said Grant Fredericks, forensic video analyst with Forensic Video Solutions. He is a contract instructor at the FBI National Academy in Quantico, Va., and teaches at the Digital Media Evidence Processing Lab for the Law Enforcement and Emergency Services Video Association (LEVA).

Rapid changes in technology have added to the challenge.

BURDENS

technology create potential and challenges.

“This is probably the most challenging issue that we’re dealing with in law enforcement and emergency services in a number of years,” said Scot Haug, chief of police in Post Falls, Idaho, and president of the Idaho Chiefs of Police Association.

The experiences of the city of Vancouver, British Columbia, illustrate these rapid changes — and the challenges they present.

Back in 1994, hockey fans in Vancouver rioted when the local NHL team, the Canucks, lost in the Stanley Cup Final. Fredericks was in charge of the forensic video unit for the Vancouver police at the time, and his team was responsible for sorting through 100 hours of VHS tape to see if it offered any evidence that would help in the investigation.

Fast-forward to 2011, when the Canucks again played in the Stanley Cup Final, and again lost.

“About 150,000 people were watching the game in an area of downtown when at the conclusion of the game a couple of vehicles were overturned and set on fire,” said Constable Brian Montague, media relations officer with the Vancouver Police Department, “that prompted a large group in the crowd to begin rioting, looting stores and committing other acts of violence and property damage.”

During the event, the police officers were focused on dispersing the crowd and preventing violence, not arresting individuals for damaging property, Montague said. But rioters also cost several million dollars in property damage, and police wanted to hold them accountable. So they put out a call for video of the event and received more than 5,000 hours of recordings from business security cameras, private cellphones and other sources.

“The sheer number of recordings from the riot was overwhelming, and many of the cameras used different formats,” Montague said.

Officials called in experts from LEVA, with whom Fredericks was working at the time. He and a team of more than 50 experts in Indianapolis viewed and analyzed all the video in about two weeks.

“Getting the data into a format that was viewable was at least half the job,” Fredericks said. The other half was watching all the video and tracking suspects from one video to the next.

The team set up a coding system to



Video has become an important tool for law enforcement, but it comes with burdens.

identify suspects by characteristics such as male/female, white/nonwhite and what type of clothing they were wearing. Since many of the fans were wearing Canucks jerseys and hats, they assigned a code to each type.

They then went through the list of people who had been tagged as committing criminal acts, entering the code for each person in the system to see if another analyst had seen the same person committing a different criminal act. That process was “almost automated, very quick,” said Fredericks. Although there were a few people who seemed to have committed just one crime, “in most cases these people were quite active.”

The police used social media, traditional media and a website to post the pictures of the offenders and ask for the public’s help in identifying them. Hundreds of suspects were eventually charged.

The story of the Vancouver hockey riots illustrates the challenges of video evidence — how to analyze thousands of hours of video from different sources — and the potential. And since 2011, advances in technology have increased both.

For example, Fredericks said that new products make it easier to play multiple types of video, something that would have made the investigation of the 2011 riots go more quickly. But as police officers adopt body-worn cameras, for example, and even more members of the public start recording events on their cellphones, the volume of video has increased.

Jonathan Lewin, deputy chief of technology and records for the Chicago Police Department, is working on solving these technical challenges for his agency. The goal is a scalable, cloud-based platform that will manage video evidence — whether from body-worn cameras, interview cameras in interrogation rooms or other sources — and deliver it to authorized recipients. It will also include still photos and digital audio from the 911 system.

“There’s a lot of content,” Lewin said. The department has been running a pilot project with about 30 body-worn cameras but is about to deploy them in much larger numbers. This, along with more content being digitized, means the volume of content will continue to grow.

Those working on improving the systems for gathering, storing and analyzing video evidence point to numerous ways it helps law enforcement and emergency management — advantages that could become even greater as the technology matures:

- Body-worn cameras protect both police officers and the community. “We expect police officers to handle some of the most challenging situations,” Haug said. “In this day and age of policing, everybody has a cellphone.” Video evidence can help clear an officer who is accused of wrongdoing and can also help community members in cases where officers do overreach.
- Video evidence can help in court cases. Some cases that might otherwise have gone to trial are now being settled with a plea once the defense attorney sees the video evidence, said Haug. In other situations, prosecutors may decide not to pursue a case after seeing the video.
- Footage can help with evaluation and training of police officers. Having video of difficult situations can help law enforcement leaders determine when the staff could use more training, and in some cases those videos could be part of the training.
- Video provides additional evidence in investigations.

“The most prolific sources of evidence available to law enforcement come from video images,” Fredericks said. And it’s not just the video of an actual event, such as a riot, that’s important. Once suspects have been identified and questioned, investigators can canvass the places they said they had gone in the days prior to the event and see if they show up on surveillance videos. This helps investigators test the suspects’ claims and in some cases learn more about people who were helping them.

“When we have that much video, we can tell a more complete and accurate story,” said Fredericks. “It makes a case that’s incredibly strong and often leads to guilty pleas.”

As the technology continues to improve, it could be even more helpful. For example, the Chicago Police Department has access to 26,000 cameras. “Can we make them more effective through technology? We don’t have 26,000 people watching them,” Lewin said. Instead, the department has people watching video in certain areas during certain hours, “but the sheer volume of video feeds

makes it impossible to watch all of them.”

If analytics could help a limited number of human watchers know where to look on the surveillance videos, “it might be finding things that you don’t normally find,” he said.

Active monitoring of surveillance video is crucial to making it effective, said Nancy G. La Vigne, director of the Justice Policy Center at the Urban Institute. The group published a study in 2011 of how Baltimore, Chicago and Washington, D.C., were using surveillance cameras and whether they were effective. The study found two crucial elements to an effective program: saturating an area with cameras and having the video actively monitored by people.

“Active monitoring is pretty critical,” La Vigne said. But while agencies budget for the hardware and software required to run the systems, they don’t always think about what it will cost for people to watch them. This is an area where advances in technology may help in the future.

“If you don’t have the resources, then the only thing you can do is pull up camera footage after an incident” and hope it shows what you need, said La Vigne. Often, though, a critical event took place outside the camera’s view, for example, or the video quality wasn’t good enough to get license plate numbers.

Despite the potential of both current and future video evidence technology, there remain enormous challenges.

One is storage. “What do we do with the massive amounts of video files that we have?” Haug asked. “This is one of the biggest challenges that we’re facing in law enforcement right now. I work for a fairly small agency in north Idaho, with about 50 officers, and we have over 100 terabytes of video data from officers’ car cameras and body-worn cameras.”

Once agencies choose a storage solution — whether they pay a hosting service or do it themselves — other questions arise. For example, how long should video be kept?

Haug said there is good reason to keep it at least for a period of time.

“You don’t know what you don’t know,” he said. Something that today is innocuous may turn out to be evidence tomorrow — for example, even video that doesn’t show a crime may show a suspect or his associate just beforehand or afterward.

Analyzing video is also a challenge. The Chicago Police Department recently received a grant to test analytics tools that can help flag video that a human should look at more closely, Lewin said. Some tools also help with redaction, or blurring faces of people whose identities should not be released.

“What can analytics do in an actual real-world setting?” asked Lewin. For example, will the software be able to flag unusual behavior — or alert officers to a traffic accident — even if the camera angle and lighting aren’t perfect?

Departments also need to be able to find specific video evidence when they need it. “If you have a whole bunch of video, it doesn’t do you any good until you have a way to catalog it, search it and store it,” Haug said.

Finally, making the video evidence accessible to those who should have access to it — and inaccessible to those who should not — is complicated. Exactly who should get access to a particular video, and when some parties’ faces should be blurred, is governed by law and departmental policy. The laws vary by state, though there are also federal privacy laws governing, for example, release of anything that might contain medical information.

The Seattle Police Department, for example, posts videos on YouTube after approving them for release. In other states, privacy rights may be stronger and the public’s right to see the videos not as strong. Illinois has a detailed law that took effect Jan. 1, 2016, covering not just how officers must use body-worn cameras but also under what circumstances the videos should be released to the public.

Technology may also be able to help with accessibility. Lewin said a good system can provide better controls and security than the old way of handing out copies of a DVD: Certain people have permission to view only, others can download and copy it, and still others can share it, for example.

“People can request a lot of things, and this will make it more efficient to comply with those requests,” said Lewin.

As they tackle the challenges posed by video evidence — and look forward to the advantages it can provide — experts expect the field to grow and mature.

“It’s an emerging technology. We want to see what the potential is,” Lewin said. “I think it’s a trend that’s going to continue.” +

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By David Rath

California EMS agencies pilot solutions with health information exchanges.

EMS and Health

Health-care providers are starting to make progress on routinely sharing patient data between care settings, although plenty of challenges remain regarding the interoperability of different software systems.

One sector that has been excluded from the health information exchange ecosystem, however, is emergency medical services (EMS). Even though many EMS agencies have adopted electronic patient care reporting (ePCRs) software, those systems use different data standards than the electronic health records (EHRs) used by hospitals, making interoperability difficult.

So what happens today when paramedics transport patients to the hospital and hand them off to emergency department staff?

"In the current scheme, they print out or photocopy their run sheet recorded in the field," said Dan Smiley, chief deputy director at California's Emergency Medical Services Authority (EMSA). "Even if it is done on an ePCR, they will print out a version and hand it off. The capability of hospitals using

EHRs to work with a paper record is limited. It is not searchable, and there is no way of linking that data. It is not interoperable."

In a 2013 survey conducted for EMSA by Lumetra Healthcare Solutions, California EMS agencies were asked if their ePCR currently interfaces to hospital EHRs. A majority of agencies (94 percent) indicated that the ePCR does not interface with hospital systems. When asked if the hospital EHR data interfaces to providers in the field, all agencies replied that they did not receive data from the hospitals. When asked what data elements needed to be interfaced between the ePCR and the hospital EHR, the most common response was that patient outcomes and discharge data were needed.

EMS agencies and hospital emergency departments would like patient information to flow in both directions to speed diagnoses and improve care and efficiency. With a \$2.75 million, two-year grant from the federal Office of the National Coordinator for Health Information Technology (ONC), California EMSA is getting ready to set up pilot projects with

regional health information exchanges (HIEs) and EMS agencies to work on both day-to-day patient handoffs as well as how data about displaced patients could be accessed during an emergency such as an earthquake.

Smiley said the goal is to make EMS a full participant in the electronic exchange of health information, with the capability to:

- Search a patient's health record for problems, medications, allergies and end-of-life decisions to enhance clinical decision-making in the field;
- Alert the receiving hospital about the patient's status directly onto a dashboard in the emergency department to provide decision support;
- File the emergency medical services patient care report data directly into the patient's electronic health record for a better longitudinal patient record; and
- Reconcile the electronic health record information including diagnoses and disposition back into the EMS patient care report for use in improving the EMS system.



Data

Partnering with California's regional HIEs makes sense because they already play a role in transmitting data from one setting to another, according to Smiley. "Right now that is the only hub we have, the only infrastructure to be able to search multiple sources of information," he said. When paramedics see a patient, they don't know at which hospitals the patient has been seen before. "So the HIE is the only place we can go to query and return information from a multi-site search. If we only had one ambulance provider and one hospital in a small town, that model might be different, but most larger systems in California have multiple ambulance providers and multiple hospitals, so we need to have a hub."

"We are hoping to achieve bi-directional exchange of information in a pre-hospital setting, but the whole idea has some problems associated with it," said Robert "Rim" Cothren, executive director of the California Association of HIEs, which is working with EMSA on the project.

First, Cothren said, the data standards used in ePCRs are not a direct match for the

standards used in hospitals. "People look at it and say HL7 is driving both of those, but there is very little overlap between standards used in ePCRs and EHRs. That translation is going to be a problem we haven't even started to address yet."

Second, Cothren asked, how do you ensure you have the correct patient if the only information you have is a 911 call and an address? One of the big challenges is patient matching: how to identify the patient and where to find records associated with that person.

Another challenge is making sure paramedics aren't flooded with too much information in clinical documents containing the patient's entire record. "The truth is they need to know very little — perhaps a problem list, allergies and medications," Cothren said. "They don't need a family history or most recent labs. They do not want a barrage of information."

Cothren agrees with Smiley that the HIE is a natural fit as an intermediary between EMS and hospitals. First, it has the same footprint as EMS — both are

regional services. "HIEs integrate data between a broad set of stakeholders," he added, "and this is merely another stakeholder managing a patient in a different part of the care life cycle. But the first thing to do is develop trust among the community. That is in the sweet spot of what HIEs do."

Although data sharing between EMS agencies and hospitals is far from commonplace, there has been progress made in a few cities and states. For example, the South Metro Fire Rescue Authority in Colorado's Douglas and Arapahoe counties has joined the state HIE, CORHIO, to enable its paramedics to receive real-time hospital and lab information via a Web portal.

In 2010, the Rochester Regional Health Information Organization in western New York started integrating EMS data into its exchange to improve care coordination. Research there showed that in 25 percent of EMS calls, patients are not

transported anywhere. “Primary care doctors have no idea what kind of care is going on in the community in those cases,” said Jill Eisenstein, the organization’s interim executive director. So the HIE connected electronic pre-hospital care documents from two vendors to the HIE.

Although EMS data is quite different from clinical data, they put together a style sheet so doctors could easily find the information they were looking for. “We have those documents automatically sent to the HIE at the close of an encounter,” Eisenstein said. “We send an alert to anybody signed up as a provider for that patient. It is also available in our query portal.”

Perhaps the most progress has been made in San Diego. For the past six years stakeholders there have been working on pre-hospital communication and the development of an EMS hub hosted by the San Diego Health Connect HIE. Built with help from federal grant funding, the EMS Hub is a standalone, cloud-based system that collects 911, computer-aided dispatch and ePCR data from all the agencies that transport patients and combines those sources under a single presentation. “Then we had to figure out which situations and use cases it is appropriate for in real-time to forward ePCR data from an ambulance en route to the emergency department,” explained San Diego Health Connect Executive Director Daniel Chavez.

San Diego Health Connect is about halfway through implementation with all the emergency departments and EMS agencies in San Diego County. Some emergency departments use a Web portal to access the information, and others are integrating the data feed directly into their EHRs.

“A big challenge is the data governance to get hospitals to share clinical data so EMS agencies can close the loop,” Chavez said. San Diego identified the narrow data set that EMS needs for quality improvement and automated putting that information in the EMS Hub. “Hospitals don’t want others to do reporting on their data,” Chavez said. “We had to create specific rules and guidelines for that data. We make it available for seven days after the close of an incident, and it is incumbent on EMS to close out their staff work in seven days. It is not the best solution, but a

compromise. As we learn to work together, we hope to extend that seven-day window.”

Another challenge, Chavez said, is getting all the stakeholders engaged early on. “EMS agencies will say, ‘Come back, HIE, when you have all the [emergency departments] up and running and then we will get on board.’ That makes sense, but that is not the way network effect works,” he said. “You have to come on board and learn with the whole community. It is a multi-year process. You have to invest. You can’t just sit back and say, ‘I am not going to talk to you until it is all done.’”

MedStar Mobile Healthcare in Fort Worth, Texas, is just starting to deploy a health-care integration engine called Infor Cloverleaf that helps exchange ePCR data with emergency departments.

MedStar, the trade name of the Area Metropolitan Ambulance Authority, which serves Fort Worth and 14 other cities in the north Texas area, started by deploying a new ePCR from ImageTrend, said Paul Trusty, MedStar’s IT manager. The ePCR exports a file that Infor Cloverleaf can process and either deliver certain data elements to the hospital, or the hospital can choose to just receive a PDF file and attach it to the medical record.

Trusty said that MedStar couldn’t count on an HIE to play the middle man. “One of the challenges with HIEs in this area is the number of them,” he said. Almost every hospital chain has its own private HIE, and there is one sponsored by the state. “It ends up that even with the promise of HIE, the data is not all in one place; it is scattered everywhere.”

Like EMS agencies in other states, MedStar wants the data flow to be bi-directional. “We want medications and allergies information on the front end,” Trusty said. “That is a future direction we would like to go.” As well as working in IT, Trusty was a paramedic for several years. Sometimes the information you are given doesn’t match the patient’s presentation, and paramedics have to decide whether to treat or not, he said. “That could be answered if we had better patient history information. I think that is better care for the patient and better systemwide. We also want to get data back electronically on patient outcomes and demographics to optimize our processes here.”

Another use case that California EMSA is addressing with the ONC grant involves connecting first responders, doctors and nurses to patient records in an emergency.

Scott Afzal, director of health information systems at Audacious Inquiry, a Baltimore-based health policy and technology firm, was asked by ONC to make recommendations about how health information could be better shared in disaster response. His team targeted two geographic areas that are vulnerable to a high number of natural disasters: California and the Gulf Coast (Louisiana, Mississippi and Texas). “We traveled throughout California with Dan Smiley and met with regional EMS leaders and heard from them and HIE leaders in their communities,” he said.

Afzal said one lesson from Hurricane Katrina also informed their thinking. The e-prescribing network provider Surescripts enabled responders to use its medical history query function on an emergency basis to look up which medications people were on. “That was a valuable service focused on an important data type,” he said. “It was set up ad hoc on the fly with no planning. With some planning, we could figure out how you might credential first responders and volunteers for access to this information and re-establish connectivity to sources of information and work flows.” That is what the California team is now pursuing. It’s building some disaster response infrastructure to pilot and validate the efficacy for broader use around the country.

The pilot project is called PULSE (Patient Unified Lookup System for Emergencies). Smiley said the exact technology infrastructure they will use is still unclear. “We want to make sure any provider can go directly from their EHR and search for and find information in a systematic manner,” he said. “But in a disaster situation, in mobile field hospitals or care sites, where an EHR is not immediately available, then the pathway of a Web portal is probably the easiest methodology.”

EMSA already has an online system to authenticate credentials for disaster volunteers. “We want to make sure that all of our disaster health-care volunteers who need access to records in an emergency can get it,” Smiley said. ⊕

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Faking Chaos

The Homeland Security Simulation Center offers realistic training on disaster preparedness and response through a virtual reality platform.

By Margaret Steen | Contributing Writer

After first responders in Gresham, Ore., handled a high school shooting, emergency management officials realized that they needed to improve their training, especially for law enforcement.

The incident had “a lot more complexity than just neutralizing a threat, which is what they’re focused on,” said Kelle Landavazo, emergency management coordinator for Gresham.

Reuniting students with panicked parents who are arriving at a campus — while keeping track of who has been picked up, and by whom — is a major logistical challenge. So is coordinating the efforts of everyone who is responding.

“In any kind of school incident, you have a school who is in their own way an incident commander,” in addition to the fire and police personnel, Landavazo said. And with the advent of social media, “the public information piece is now just enormous.”

Landavazo’s team decided to create an exercise that would help responders learn to better coordinate all these parts of the response. They turned to the Homeland Security Simulation Center at Concordia University in Portland, Ore.

“We wanted to do something that was more than a tabletop but not a full-scale exercise,” Landavazo said.

The simulation center, part of Concordia’s Center for Homeland Security Studies, offers specific training on disaster preparedness and response for the university’s students and for outside groups. The centerpiece is the Advanced Disaster Management Simulator virtual reality platform.

During an exercise, the simulator allows first responders to progress through a scene using avatars. Others are down the hall at a command post, receiving



information through a computer feed and being interviewed periodically by actors pretending to be reporters.

This strategic messaging piece is critical, said Cliff Gyves, director of the Homeland Security Simulation Center. “We give them a sense of information chaos through our fake newscasts,” he said. “The kids all have phones. You can tell them not to post, but they will, and it’s going to get picked up by the regular media.”

Clients from the local area as well as other states have used the simulator, often at the end of a one- or two-day training session. Although schools wanting to simulate their response to an active shooter are frequent clients, other scenarios involve situations such as a disaster at a large construction site, or a biohazard. The center has a mobile version of the lab that can do smaller simulations too.

“We can take a client’s existing plan, develop a scenario around that, and have them run through the simulation to recognize any gaps,” said Scott Winegar, director of Concordia’s Center for Homeland Security Studies. They can then modify the plan to correct the problems and do a final exercise to see if the modifications worked.

The simulator, which has been operational for about six months, took several months to develop and install. It is currently being used on average at least once a week. For most services that include a simulation – normally formal classroom training with a capstone simulation – the

rate is \$2,000 for four hours and \$3,500 for a full eight-hour day, Gyves said.

For Landavazo’s team, the exercise pinpointed gaps in their operations. First responders used the simulator while a police sergeant and a fire battalion chief worked in the control room. They had subject-matter experts injecting information into the exercise as it went along.

“In the first exercise, they didn’t have the media in a secure location, so the controllers had the media truck go all the way up onto the scene and the responders had to deal with that,” Landavazo said. “This reinforced the issue that they hadn’t secured where the media was going to be located.”

Landavazo said there were several advantages to using the simulator as opposed to doing a tabletop exercise:

- Neutral location. “It worked out extremely well, and I think the biggest reason for that is that it was on neutral ground,” said Landavazo. Exercises that take place at work can feel more like evaluations, where people are worried about making mistakes. Because this was part of a university, she said it felt more like a learning experience, where mistakes are part of the process.
- Active engagement. “When you’re in the sim lab and you’re playing out your exercise, you have no choice but to participate,” Landavazo said. Sometimes during exercises, “if a group is feeling less comfortable, they don’t really engage.” Engagement is easier because of the all-encompassing nature of the lab.

The simulator allows first responders to progress through a scene using avatars as others at a command post receive information through a computer feed.

- Ability to run two identical exercises. The lab made it easy to run the simulation twice, with different people participating each time.
- Ability to pause the exercise. This is critical to make the exercise more of a learning experience. The simulator can be paused so participants can regroup – for example, so an early mistake doesn’t doom the entire exercise.

Other clients have found the ability to pause the exercise to be helpful as well, Gyves said. For example, if partway through the exercise it’s clear that the responders should have sent police to stop traffic – but they didn’t, and now the other responders can’t get to the scene – it’s possible to stop the exercise and go back to let the participants correct the mistake.

“When you get to a point where you’ve backed yourself into a corner and no further learning is going to occur, we can pause it,” said Winegar. “We can go back in the scenario, start it again and allow them to make different decisions to see how it turns out.”

The simulator allows for highly customized exercises – even using video backdrops of particular locations, for example.

The simulator also illustrates how different parts of a scene keep progressing as responders focus on other areas. For example, it’s easy to say during a tabletop exercise that you plan to put out the fire on the east side of a building first, then move to the fire on the west side.

“The way the simulator works is in real time,” Gyves said. “The commander is driving all the fire trucks to the east side but gets stuck in traffic because you didn’t manage the traffic flow. Then actually putting out the fire takes time. As they’re putting out the first on the east side, the fire on the other side grows. Eventually it gets dark, and now they have to deal with putting lights up. The simulator keeps you honest.” 🚒

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On Target

Alerting evolves to more precise mobile delivery.

By Rick Wimberly | Contributing Writer

Strong forces are at work to make emergency alerts more mobile and precisely targeted. Long gone are days when a siren blasting a loud horn near and far was sufficient to spur people to action. Now, people want information that's precise, pertains specifically to them and is available wherever they are regardless of what they're doing. Plus, studies show that people generally won't take protective action unless they get an alert from at least two sources.

Add to the mix the fact that today's emergencies are local and difficult. Our threats don't include a fear that bombs will be dropped on our cities from a warring nation. It's more likely that a terrorist will plant a bomb where we live, work, learn, worship and play. Or a flood will hit an unexpected neighborhood. Or a tornado will abruptly change its path. Or someone will kidnap a child and head for the state's border. We could go on.

It's easy to see why emergency alerting has evolved and continues to do so. Targeting specific areas became more practical in the late 1990s when telephone alerting

was introduced. Practitioners could draw a diagram on a digital map and direct alerts to specific home and business phone numbers. They can do much more now, according to Russ Johnson, director of Public Safety and Homeland/National Security for Esri, one of the first providers of digital mapping for alerting. He said alerts can be much "smarter" through use of real-time mapping where "live" information from many sources can be analyzed. Then, a geo-fence can be established around the area. If something or someone crosses into the fenced area, an alert can be automatically issued.

Todd Piatt, chief product officer at Rave Mobile Safety, said new capabilities to make alert delivery more geographically precise became real because of uniquely identifiable and addressable personal devices. "Each of these devices is location aware, presence aware and uniquely tied to an individual with specific attributes," he said. "It's now possible to send a highly targeted message, with content relative to an individual because of who they are, where they are and what is relevant to them, and know that the message was received."

North Dakota Homeland Security Director Greg Wilz is impressed with the granularity of precise alerting made possible by geo-fencing. "Obviously narrowing a targeted polygon area in which the public can be notified allows you to get the message to those affected and not over-alert," said Wilz.

Ping4 CEO Jim Bender calls use of geo-fencing "hyperlocal mobile alerts." The company uses technology that lets mobile users give permission to reveal their whereabouts as they move around. Wilz said geo-fencing alerts "keep people out of harm's way, allowing them to be a part of the solution, and not the problem, by giving them information. Facing the facts, a very low percentage of people are really prepared for the next likely event in their area. Fast, effective communications may allow for some to improve their situations whether it be evacuations, power outages or anything in between."

Wilz added that it's challenging to get people to download apps that make geo-fenced alerts possible. "As people see the value in emergency alerting or being able to access critical emergency information, it will gain in becoming a must-have," he said. "The people who send out the alerts and notifications need to do the best we can to keep alerts worthy of the time and efforts required by the receivers. As senders gain the trust of the receivers, more will participate."

A mobile alerting solution that doesn't require app downloads is Wireless Emergency Alerts (WEA), managed by FEMA's Integrated Public Alert and Warning System (IPAWS). Most cellphones are automatically equipped to receive WEA messages, but precise geo-targeting of mobile devices has been an issue. Regulations that established WEA required mobile carriers to alert to an area no larger than a county. Some practitioners complained, saying a county is too large.

In reality, geo-targeting via WEA is more precise than a county area and is becoming even more so. Most cell carriers have built their systems so practitioners can designate smaller geographic regions. Brian Josef of CTIA, The Wireless Association, said, "Both alert originators and providers have gotten better at targeting through learning experiences." In the meantime, he said, "Carriers have been working with alerting authorities to help them understand the scope and breadth of their networks."

The FCC is proposing that WEA messages be more detailed and geographically targeted. FCC commissioners recently approved tentative rules that would extend the length of a WEA message from 90 characters to 360. The messages could contain URLs, phone numbers and more data under the proposal. At the FCC meeting on the topic, FCC Commissioner Jessica Rosenworcel said the regulations “need to be refreshed to reflect our reliance on mobile devices and their unique ability to keep us informed when disaster strikes.” The rules would be subject to public comment and final action by the commission.

Johns Hopkins University has an idea for targeting WEA messages. A study commissioned by the U.S. Department of Homeland Security Science and Technology Directorate suggests that WEA could take advantage of geo-fencing technology similar to the way Esri, Rave and Ping4 solutions do. Johns Hopkins’ Applied Physics Laboratory calls the concept it developed for WEA Arbitrary-Size-Location-Aware Targeting (ASLAT). Through ASLAT, alerts would be sent via cell towers

to a larger area than desired, but GPS technology being used for other purposes would narrow delivery to only the desired area.

Another concept comes from a group of broadcasters and TV set makers that’s promoting a new high-definition standard for television called ATSC 3.0. The group calls itself the Advanced Warning and Response Network (AWARN), which is currently being tested by FEMA at an IPAWS laboratory.

AWARN says when ATSC 3.0 is implemented, new bandwidth available from TV stations could be used to deliver alerts to mobile devices. The organization’s John Lawson said that using TV signals under the new standard could not only reach an unlimited number of devices within a TV station’s coverage area, but can also send rich media content. Lawson doesn’t see AWARN as a replacement for WEA, but rather a supplement by offloading data traffic from the cell networks. To make AWARN a reality, he said, the FCC must give broadcasters flexibility to phase in the ATSC 3.0 standard. Then consumers will need to buy devices that receive ATSC 3.0.

The FCC is aware of geo-targeting issues. Chris Anderson, chief of the FCC’s Operations and Emergency Management Division, recently told a summit on ATSC 3.0-enabled alerting that he’s optimistic that alerting “is only going to get better and better.” He said being able to deliver more information with alerts, possibly through click-throughs, will help keep the public from becoming “numb” to alerts. Anderson is particularly hopeful about concepts that would let citizens receive alerts, then provide input back. His optimism is shared by Roger Stone, deputy assistant administrator of the FEMA division that oversees alerting. He told the summit, “HD signals offer tremendous potential for interactivity” associated with alerting and that IPAWS has led to the recovery of 19 missing children.

With promising new methods of more precise alerts emerging, we could be entering a new phase of the evolution where we reach people regardless of who they are, where they are and what they’re doing. +

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Bridging the Seismology Gap

Lucy Jones' expertise put Los Angeles on the road to enlightened earthquake policy.

Lucy Jones received one of the most prestigious awards for a federal employee last year to the surprise of no one. The United States Geological Survey (USGS) seismologist earned the Samuel J. Heyman Service to America Medal in the citizen services category for her work in seismic research. That award came largely because of her work in 2014 in Los Angeles Mayor Eric Garcetti's office for a project that aimed to shape public policy toward the eminent Big One the city faces. The work resulted in the Resilience by Design report and important legislation. Garcetti called Jones' work with Los Angeles groundbreaking in the way it bridges the gap between seismic science and public action.

By Jim McKay | Editor

⊕ What's the *Resilience by Design* program?

Probably the most important part of the water plan actually was the creation of what we call the *Resilience by Design* program within the Department of Water and Power.

There is a full-time person in charge of seismic resilience for the system developing these retrofit projects and evaluating new projects as they come forward.

The commitment is to a future of seismic-resilient pipes. The path to that is going to be starting with a network of hardened arteries. So they're setting up priorities for replacement to maximize the network and get water to as much of the city as possible.

There are two different types of pipes. The Japanese approach is called the earthquake-resistant ductile iron pipes. The joints between the pipes are done with O-rings and flexibility.

Ductile iron doesn't break, but the joints do. In the 2011 magnitude 9 in Japan, Tokyo Disney needed so much water, so they laid their own water pipes and did it with these earthquake-resistant pipes. During the earthquake you had two overlapping water systems: one traditional and one with the new earthquake-resistant pipes in the exact same area. There were lots of breaks in the old pipes and none in the new ones, so it was a great test. The other approach is polyethylene. There is high-density polyethylene and mid-density polyethylene. There was a test installation when the Christchurch [New Zealand] quake happened and they lost water to the whole city, but the test installation did fine.

⊕ How much of an impact do you expect *Resilience by Design* to have?

The city is moving forward in a way that I was afraid might not happen. It's easier to say we're going to do something than to actually do it. And I've been really impressed at the implementation.

On the building side there were three recommendations for ordinances to mandate retrofitting. Two of them have passed and the third one is in the works. There was also a call for a voluntary rating system working with the U.S. Resiliency Council to be able to say whether a building is worth it or not. That's going forward. The

USRC was just getting started as we were doing this; they are not fully formed.

The city has gotten an agreement with them about how to rate their own buildings. On the rating system it was like the mayor was really interested in the idea of just mandating ratings. Right, we give you a rating on your restaurant. The reality is it's very expensive to rate a building.

It also really panicked building owners. Part of the reason they didn't oppose the mandatory retrofit is because we backed off a mandatory rating system. The city committed to rating all of its own buildings and disclosing the information. The rating process is underway and will be released in the winter.

The other part of the recommendations on buildings is what we call the Back to Business program, the process for a big corporation to facilitate doing the ratings right after a big earthquake. Everything is moving forward. Three are completely done and the other two are on the way.

⊕ You've said we're good at preventing deaths. What's the biggest fear?

Collapse of the economy because we'd lose our rental housing, we'll lose our commercial building stock and we'll lose our water, and people won't stay here. And like what happened in New Orleans after Katrina — it's taken them a long time to get back.

We've reached a point, at least in the Los Angeles Metro area and the Bay Area, where people know they've got an earthquake problem. What we haven't done is gotten them to the place of being aware of how they can change the outcome. That's getting better. I've been impressed with San Francisco and how they've grappled with their utility issue and the big bonds they've passed to start strengthening the water system.

We need to support getting the science to people and getting it used. I think we have an awareness of the problem, but we have not yet developed a sufficient understanding of how we can prevent the problem.

Our country is much better at responding to a disaster than preventing it. We're willing to pay firemen, but we aren't willing to pay for mitigation in general. I'm passionate about the mitigation — how do we move beyond just responding to the



Gas from a ruptured supply line burns as water from a broken water main floods Balboa Boulevard in the Granada Hills area of Los Angeles after the predawn Northridge earthquake struck in 1994. A lack of water would be the biggest disruption to area businesses during the Big One.

disaster and start being able to prevent it? Because most of it is preventable.

⊕ Talk about the water problems.

When we did our model of a big earthquake, fire following the earthquake doubled the losses and business disruption doubled the losses. Business disruption was primarily from lack of water. Lack of electricity would also do it, but it looks like we would be out of water for a much longer time.

Then there is the really big issue: Here in Southern California we get a large percentage of our water from outside the region. Last year 88 percent of its water came from outside the region and every drop of that had to cross the San Andreas Fault to get to us. There are four aqueducts serving Southern California and every one of them crosses the fault.

Up until now much of the planning has been, "Well OK, so we lose an aqueduct, we've got three others. We'll be OK." Which is not noticing a very important feature of big earthquakes — the way they become big is because there is a longer piece of the fault that breaks. The only way to have a magnitude 8 is to

have such a long section of the fault that we break all of them at the same time.

The geologists all knew that all [the aqueducts] are going to break at the same time, the water planners were assuming only one. That changes the dynamics. There are two big pieces to that. One is to retrofit Los Angeles' aqueduct, and the other one is to work with the other two entities, the California Department of Water Resources and the Metropolitan Water District [of Southern California], which operates the other three aqueducts. Both of those things are underway.

⊕ Talk about the future of response.

The USGS and Caltech jointly run the earthquake monitoring and detection system in Southern California. There is a similar partnership between the USGS and Berkeley in Northern California. All of those together along with the state Strong Motion Program is called the California Integrated Seismic Network. Since 2000 those have been tightly coordinated and are merging toward being operated as a single system.

We at the USGS have put together a plan for how we could expand on the existing



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A “Y”-shaped juncture connecting two main trunk lines that ruptured is seen on Sunset Boulevard in Los Angeles after the 1994 Northridge earthquake. Mayor Eric Garcetti’s call to strengthen Los Angeles’ water system — a pillar of his plan to ready the city for a major earthquake — would cost up to \$15 billion and require decades of work.

system where we do it so rapidly that we could provide an early warning for earthquakes. The survey put together this plan — it’s like \$16.5 million a year to operate such a system, and people want to say, “What does it cost to build it?” But that’s sort of immaterial — you have to operate it. That operation plan includes a 10-year lifecycle on the instrument, so if we operate at that level for 10 years, we will have built out the whole thing.

That’s the whole western U.S. — Washington, Oregon, and Northern and Southern California — and we would operate them out of three centers (Southern California, Northern California and Seattle) because that’s the way we’ve been operating the networks.

It’s being funded at \$5 million a year. And then we’ve been doing what we can to keep it going, building on existing networks and using existing organizations and systems. Los Angeles was able to use some UASI money to help with the network to buy instruments and hire contractors to install them. It added more than 100 new stations here in Southern California, so we have the density needed for early warning across the region.

One of our big challenges is that we need to be telling people what the shaking is going to be. Your appropriate reaction if it’s going to be barely noticeable is going to be different from something that’s bringing down your house. We need to describe how strong the shaking is going to be.

Our conclusion is we’ve done a very bad job of educating the public about earthquakes. We’ve gotten them all trained to think about magnitude. Magnitude is the number representing the size of the earthquake — it doesn’t tell you what you feel.

Intensity is the description of what you feel. We can describe the intensity of the shaking through accelerations or velocities, numbers that make the scientists and engineers happy, but in general people do a better job of having a more arbitrary scale so the Modified Mercalli Intensity Scale goes from one to 10 and describes the level of shaking. The worst shaking in the Northridge and Loma Prieta earthquakes was intensity 9.

When we have our big San Andreas earthquake, we’re going to have intensity 10 running through San Bernardino. So even though it’s smaller — 7.8 — the intensity of shaking will be stronger than

a magnitude 9 or offshore in Cascadia. Intensity tells you what you’ve got, but mostly people don’t know the scale.

One of the things the research showed us was that people remember numbers much better than descriptors. So intensity 7 means a lot more than strong shaking, but only if you know what intensity is. One of the conclusions of this is that early warning needs an education program to teach people about intensity and get them ready to use it.

⊕ Does this mean it’s hard to envision a recovery?

The big part is that the losses and the recovery can dwarf what happens in the disaster itself. If you look at Hurricane Katrina, the lost GDP is on the order of something like \$150 billion — substantially more than they lost in the hurricane itself. What we really need to figure out is how to get a quick enough recovery. It also doesn’t make sense to say, “Let’s try and prevent all losses.” That’s really not doable, but we can prevent a lot of them. What we should be trying to do is focusing on the ones that have the biggest potential for delaying the recovery. ⊕

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No-Fault After-Action Reviews

Preparing an after-action report (AAR) to identify what went well and what needs improvement is standard after a disaster exercise, be it a seminar, tabletop, functional or full-scale exercise.

Based on the AAR, an improvement plan can be formulated that, according to the FEMA exercise formula, will ensure that the same errors or omissions are not repeated during an exercise or an actual emergency or disaster.

If you have a mathematical formula, following it, like following a recipe, will produce the results that you expect — yet, it doesn't seem to be the case when applied to the process we've established for making corrections to our emergency management exercise program. Let's explore some of the causes.

THE VALUE OF REPETITION IS LOST SINCE THE PLAYERS ARE CONSTANTLY CHANGING.


Ask any emergency manager what the No. 1 finding from any functional or full-scale exercise is, and they will tell you it is the communications function that was identified as needing improvement. Why then does communications remain the thorny problem that it is? If we can anticipate that communications will be a problem, we should be able to address it and emphasize that function during the preparedness phase before an event and during the actual exercise.

In reality, one of the primary issues with AARs and improvement plans is that no one pays attention to them once they are completed. They are written, go in a three-ring binder and are placed on a shelf. The traditional disaster preparedness phase includes planning, training and exercising, yet in most emergency manage-

ment organizations, not that much time is actually spent by staff in the areas of training and exercising. Instead, emergency management staff members get sucked into program management.

Thus, training and disaster exercises, especially those associated with a specific plan, become somewhat rare events. I don't lump all the FEMA-required Incident Command System and National Incident Management System courses into the category of beneficial training that makes a difference in exercises and events. People take the online courses, punch their ticket as being trained, forget what they might have learned for the moment and move on with their normal jobs. In performance management terms, we are counting "butts in seats" at training classes as accomplishing something. Rather, the true measurement is people's ability to do their disaster jobs, which is harder to measure and is a subjective measurement at that.

There are other dynamics at work. The first is that when it comes time to conduct the next exercise, many of the faces have changed. We live in a very mobile society, and with people retiring, changing jobs and having other priorities beyond coming to some exercise (you can put elected officials and senior management in this group), the same mistakes made in the previous exercise are made by an entirely new cast of characters. The value of repetition is lost since the players are constantly changing.

Back when I was in the Army in Armored Divisions, we said there were two glass balls: training and the maintenance of equipment. Yet I never saw anyone relieved of command for bad training. So it is with our state and local emergency management programs. It takes an event, a disaster, before someone is axed for a poor outcome. But then no one can seem to put the formula of two plus two together to understand that it was a lack of a good AAR system and training that was the issue. 



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Safer Rails

The technology exists, but why isn't it being deployed?

By Adam Stone | Contributing Writer

In September 2008 a Metrolink commuter train collided head-on with a Union Pacific freight train in Chatsworth, Calif., killing 25 people and injuring more than 100. On Dec. 1, 2013, a Metro-North commuter train derailed in the Bronx, killing four and injuring dozens of others. The train's engineer had fallen asleep and failed to slow the train from over 82 mph to the maximum authorized 30 mph as it entered a curve.

These and many other incidents could have been avoided, according to the National Transportation Safety Board, if railroads had implemented positive train control (PTC). They were supposed to do just that by the end of 2015. They missed the deadline, but got a reprieve, with Congress pushing back the deadline for PTC implementation to 2018.

Congress first mandated PTC in 2008 for rail lines used to transport passengers or

toxic-by-inhalation materials. The unfunded mandate gave railroads seven years to comply. Questions arise: Why push back implementation to 2018? Why the delay? Will PTC actually help, whenever we get there? And what will it mean to emergency managers?

Steep Hill to Climb

PTC is meant to kick in when human error threatens safety. These systems use a combination of GPS satellite, state-of-the-art signaling and advanced databases in order to determine the exact location, direction and speed of trains. The system warns the operator of possible trouble and takes action to stop the train if there is no response.

Suppose a train is moving full speed toward a signal or into a speed-restricted area. If the operator doesn't take action, PTC will put on the brakes.



This is no small feat, according to the Association of American Railroads (AAR). A full deployment would include, “a complete physical survey and highly precise geo-mapping of the more than 82,000 track-miles ... on which PTC technology will be installed, including geo-mapping of nearly 460,000 field assets (mileposts, curves, grade crossings, switches, signals and much more) along that right-of-way,” AAR reports.

Complex, yes, but we know how it works. So why isn't it done? Well, it may not be quite that simple.

Despite understanding the basic technology, “railroads still have had to hire thousands of software developers and safety experts,” said AAR spokesman Ed Greenberg. Mostly this development has gone toward ensuring PTC can deliver on its safety expectations. Despite advances, various elements of PTC still show a 30 to 40 percent error rate. “We are talking about

unprecedented technology. PTC is a complex system of systems and not off-the-shelf technology. It has had to be developed from scratch.”

In addition, the industry wants to reassure itself that the more than 70 railroads on the system will be able to exchange information. Without the free flow of data between rail lines, it's unlikely PTC would have enough information to carry out its duties. “Interoperability is the key here,” Greenberg said.

A range of hurdles continues to stymie full implementation, according to a report to the House and Senate Appropriations Committees by the Federal Railroad Administration (FRA).

- **Wireless Spectrum Availability:** Individual railroads are having trouble acquiring the needed spectrum for the radio signal that connects elements of PTC. In some cases, holders of spectrum

won't sell. In other cases the railroads find the conditions of a spectrum sale “neither fair nor reasonable.” Other spectrums are tied up in legal situations.

- **Hard-to-access equipment:** “The number of suppliers who currently manufacture PTC system components is limited,” FRA notes. Only a handful of companies can make the needed components, which in turn slows deployment.
- **Safety Plans:** As of August, FRA has received just three of 38 required PTC safety plans despite being in “constant and consistent contact with railroads to assist on safety plans and offer guidance.”

Some Success

Despite hurdles, freight carriers have made headway. By the end of 2015 more than 14 percent of 60,000 miles of track were PTC

⊕ Public Safety and Security

equipped, AAR reports, along with 31 percent of 22,000 locomotives. Freight rail has spent more than \$6 billion on these systems.

Overall, PTC has seen “some successful, but limited, deployment,” according to the FRA. As of August 2015, Amtrak had covered 60 route miles between Chicago and Detroit with its own variant of PTC, as well as in parts of the Northeast corridor, while BNSF Railway Co. has deployed systems on “a limited number of pilot territories.”

Amid all the competing pressures and declarations of progress, one thing emerges clearly: PTC will be late. Knowing they weren’t going to make the 2015 deadline, the railroads petitioned Congress and successfully got the due date pushed back to 2018, while pledging that the extension wouldn’t slow their efforts. “[T]his does not change our approach toward working aggressively to implement PTC as quickly as we possibly can and ensuring it can reliably deliver the safety features we all desire,” BNSF Executive Vice President and Chief Marketing Officer Steve Bobb said when the extension was passed.

When full-blown PTC finally is declared, all involved agree the rails will be safer. By some estimates, human error accounts for 40 percent of rail accidents. To the extent that PTC can remove human error from the equation — and that is exactly what it is designed to do — emergency management should see its load lightened.

Managing Emergencies

Fewer derailments, especially of trains carrying hazardous materials, will no doubt benefit emergency managers, not least financially. The cost of a derailment can be staggering when one includes lawyers, damages, repairs and so on. The hit to the emergency community’s budget is no less significant. Take for example a 2014 incident in downtown Lynchburg, Va., in which several CSX tanker cars carrying crude oil derailed and caught fire along the James River. The event cost roughly \$8.99 million in emergency response and cleanup, according to the nonprofit research firm Sightline Institute.

While PTC won’t eliminate all train accidents, it is one piece of the puzzle that will vastly improve safety under specific circumstances, said FRA spokesman Michael Booth. By overriding driver error, at the very least



In 2014 several CSX tanker cars containing crude oil derailed and caught fire along the James River in downtown Lynchburg, Va.

PTC will help keep trains out of work zones and prevent derailments caused by speeding.

Knowing PTC alone won’t prevent all accidents, the FRA encourages emergency response agencies to make use of the U.S. Department of Transportation’s (DOT) Transportation Technology Center in Pueblo, Colo. The center is managed by the AAR, and has trained more than 60,000 first responders since 1985, Booth said.

The DOT has taken additional steps in recent months to help equip the emergency community to deal with rail accidents. In September the agency announced \$5.9 million in first responder grants to help protect communities from flammable liquid spills caused by rail accidents. Managed by the Pipeline and Hazardous Materials Safety Administration, the money has been earmarked for three nonprofit organizations:

- University of Findlay (All Hazards Training Center), Findlay, Ohio
- International Association of Fire Chiefs, Fairfax, Va.
- Center for Rural Development, Somerset, Ky.

“Safety is our top priority, and [these] grants will help first responders, especially volunteer firefighters in rural or remote parts of the country, prepare for and respond to

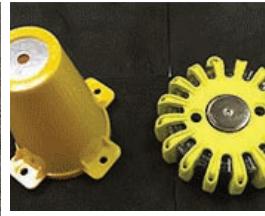
incidents involving flammable liquids,” DOT Secretary Anthony Foxx said in announcing the grants.

The emphasis on flammable liquids comes at least partly in response to the massive outflow of oil (up 4,000 percent in the past five years) from the Bakken oil fields, which underlie parts of Montana, North Dakota, Saskatchewan and Manitoba. A 2013 rail disaster involved the derailment of a 77-tank-car train carrying Bakken oil. The train exploded, killing 47 people and destroying 30 buildings.

Would PTC have prevented the disaster? The Transportation Safety Board of Canada found at least 18 probable causes, and its 12-page report never uses the phrase “human error.” Still, it does cite ineffective training and a failure to manage risks as concerns. Such factors could ultimately trigger a PTC response, under the right circumstances.

Rail lines, under various regulations, must notify emergency response authorities whenever hazardous materials are on the move. This may help emergency managers be prepared — but prevention would be even better than preparation, and PTC’s ability to prevent incidents, especially HAZMAT incidents, will come as welcome news to emergency managers ... sometime down the line. ⊕

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By Julie Anderson

Cloud Storage for Camera Data?

Police body-worn cameras have been on the rise over the last five years. Cities such as San Diego and Topeka, Kan., have already elected to outfit officers with cameras. Larger cities like Los Angeles, Houston and Washington, D.C., began testing the use of cameras last year. And state legislatures in Illinois, Texas and South Carolina deliberated over camera legislation during their most recent sessions. Topics of discussion range from

citizen privacy to the cost of purchasing the cameras and paying for storage. The startup costs of body-worn cameras on the already-strained budgets of state and local police departments are certainly an issue — but they don't tell the full story. Law enforcement faces another major challenge: keeping the video data safe and secure.

Body-worn cameras, along with the increase of

video surveillance systems, are creating massive amounts of data that agencies need to manage, store and secure. For example, the Seattle Police Department alone produced more than 360 terabytes of data from dashboard cameras. The police department in Duluth, Minn., was able to afford \$5,000 to purchase cameras, but struggled with the \$78,000 data storage fees for just the first two years of operation.

It's important to determine how the data is stored, and that should not be overlooked. Cloud technology is often cited as the most scalable way to house data. However, law enforcement agencies need clear guidelines to protect police-generated data in the cloud, considering

that cyberthreats are on the rise, including the risk of unwanted incursions from bad actors.

To understand the costs and risks of deploying a body-worn camera program, it is important to examine the total cost of ownership (TCO), a financial estimate that accounts for the direct and indirect costs of a product or system. To determine the TCO, police departments must account for the acquisition and operational costs of body-worn cameras, as well as the expenses associated with keeping the video data secure — a much higher cost than the cameras themselves.

As police departments look to cheaper, offsite cloud technology to store video data, calculating these costs is even more important. In this case, indirect costs cover potential expenses associated with incident response and liability charges if video data is breached. Without proper protocol and standards, what may seem to be the less expensive cloud solution could cost much more in the long run.

To secure sensitive information, U.S. law enforcement agencies must adhere to the FBI's Criminal Justice Information Services (CJIS) security policy, which establishes guidelines for the creation, viewing, transmission and storage of criminal justice data. Recently the International Association of Chiefs of Police issued guiding principles for cloud computing that recommend data collected through body-worn cameras be stored at the highest level of security: the FBI CJIS standard. Moving forward, departments that use CJIS-compliant cloud technology will be able to minimize risk and keep video data safe.

While safe and secure data storage is not cheap, it's an investment that law enforcement agencies must make. Only when police departments take the TCO into account will they protect their video data as well as minimize their liability and safeguard the people they serve. +

WITHOUT PROPER PROTOCOL AND STANDARDS, WHAT MAY SEEM TO BE THE LESS EXPENSIVE CLOUD SOLUTION COULD COST MUCH MORE IN THE LONG RUN.



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HOW PREPARED IS YOUR ORGANIZATION?

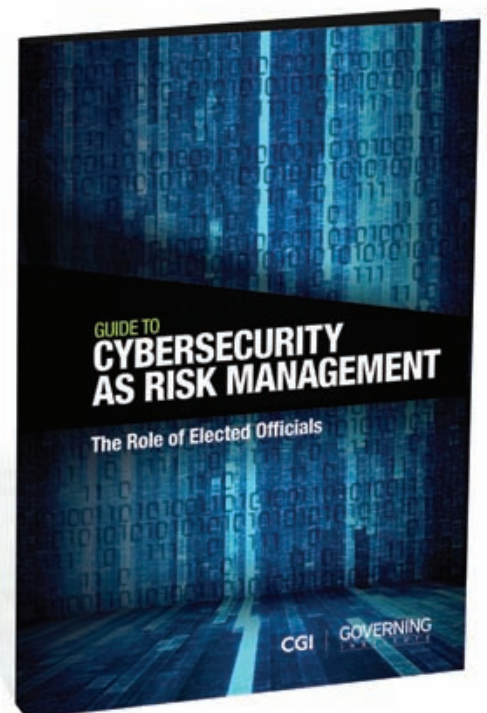
Elected officials have a unique role in government cybersecurity efforts and are held accountable for protecting critical government resources and data.
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Firetrucks
at Station
House #11 are
responding to
house fire

Workers should
treat all power
lines as hot to
safeguard against
backfeed.

TO KEEP TRACK OF THIS:



In today's complex, fast-paced world of emergency operations, you need an Incident management system that can help your team work as efficiently as possible. Designed to meet all FEMA regulations and offer 100% interoperability, DisasterLAN (DLAN) from Buffalo Computer Graphics is a fully integrated solution advanced enough to handle all emergency situations, yet simple enough to perform day-to-day tasks and non-emergency event management. Plus, the DLAN platform can be customized to meet the needs and budgets of states, counties, and municipalities.

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