EXCLUSIVE - How Internet Of Things Can Make Schools Safer From Active Shooters

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Shots rang out on Monday, June 1, 2015 inside the Sandcreek Middle School in Ammon, Idaho. Two shooters were inside the school, one shooting in the cafeteria, and one shooting in a hallway.

If this were a real active shooter emergency, the fatalities would be mounting while emergency dispatch was fielding a high volume of 911 calls from people on the scene. Dispatch would be piecing together information to determine the number and location of the shooters, how and who was being targeted and how they could be identified from whatever the callers could hear or see from their vantage.

The dispatch center would have sent the best information they could gather to responders facing a deadly threat inside the building. It would be anywhere from minutes to hours before the shooter(s) are interdicted and the building is cleared for EMS. Images could later be found in footage from the 62 surveillance cameras in the school. But, this was only a test.

The City of Ammon's decision to test shooter detection inside of a school was driven by a goal to create a use case to measure the benefits of a larger program -- the implementation of a municipal broadband system.

Ammon is a fast-growing, progressive city in Eastern Idaho. It has proximity to some of the world's most impressive natural terrain, a productive agricultural industry, a rising industrial research base and an enterprising city management team.

Bruce Patterson, technology director for the City of Ammon epitomizes the city's forward thinking spirit. With the support of the city's elected officials, Patterson went about the challenge of modernizing the city's technology operations with the initiation of a program in 2008 to construct and implement a citywide fiber optic broadband network.

The initial network focused on connecting the city's critical infrastructure and community anchor institutions, including the county emergency dispatch center. The city's broadband infrastructure currently in place provides the means to connect emergency services with hospitals, schools and other community anchor institutions.

In addition, the city committed to providing the services as a public utility. Patterson's bold vision centered on the belief that this infrastructure, which is already in place and maintained as part of normal city operations, should be made freely available to emergency services. After all, the city is already in the business of public safety, according to Idaho State Statute.

The migration of emergency communications from analog voice to a high-speed data rich ecosystem requires dependable applications with intelligent automation in order to gain acceptance from the first responder community. The amount of information modern data systems are capable of delivering would quickly overwhelm emergency operations without such proper intelligent automation that's capable of

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recognizing what information needs to be delivered in an emergency.

Patterson looked to address the burgeoning problem of active shooter scenarios with an application that could demonstrate the value of Ammon's open infrastructure approach and deliver measurable benefits. The testing performed on June 1 helped reveal how the system could be utilized and whether or not such a high-speed, data rich application could result in improved outcomes in an actual emergency.

In the summer of 2014, Patterson and his technical lead, Ty Ashcraft, initiated a search for available shooter detection technology that could be used to create an alert which included a specific camera feed which could be sent across the network to dispatch.

Working with a limited budget, Ammon offered to be a beta test site for their system in a live active shooter demonstration. Few shot detection sensors today are capable of operating in an indoor environment, and even fewer were ready to loan a system for the demonstration. Two separate sensor manufacturers responded to the call. Patterson and Ashcraft decided to demonstrate both sensor systems.

A bullet trap was ordered by the sheriff's office and the school district gave the go ahead for an indoor shooting using live rounds. In August, the two gunshot detection sensor systems arrived for the test. A long, 100' hallway in the school was set up with the bullet trap at one end and shot sensors on the ceiling. Shots were fired from the sheriff's weapons ranging from 45-caliber pistol, an AR-15 and a .308 rifle.

Patterson and Ashcraft were looking to perform a simple demonstration as a proof of concept with the ultimate vision for a system that could alert dispatch and, at the same time, prompt a video stream to be pushed across the broadband network to monitor the rapidly changing situation from the dispatch center. An individual receiving the alert and the live video would be able to make decisions related to the emergency. In addition, dispatch operators could send an image of the shooter directly to the first responders via a mobile device. The concept was illustrated with a real-time connection between local video and first responders predicated on an event report from intelligent edge devices, in this case shooter detection sensors.

The 2014 proof of concept demonstration was a success. Throughout the day of testing, it all came together. Shot after shot, the reports initiated a mobile alert via the Active911 hosted service and the video feed was cued at the emergency dispatch center every time in less than 5 seconds. From there, the dispatcher was able to grab an image of the shooter and deliver it across a mobile network to the responder's table computer all within about 30 seconds.

The reaction from the dispatch center was profound. While confirming that the demonstration clearly represented new and valuable functionality, one employee expressed some emotional apprehension about the ability to "see" an active shooter emergency as it was unfolding. There was resounding agreement that the pushed video was an instant, effortless, way to deliver information they needed to do their jobs.

The success of the proof of concept demonstration created a galvanizing environment. Upon seeing the lifesaving potential behind the development of a production system supporting the demonstrated functionalities, each of the participating partners committed to return for another round of testing in 2015 after additional development.

There were still key factors to be addressed, such as accuracy and reliability. While the system worked well in a quiet environment with only one camera to cue, problems could emerge in a real deployment. If the system were expanded to include additional schools and buildings throughout the city, the dispatch center could potentially be receiving many false alarms.

There were also concerns that in a real emergency, the system might not cue the correct camera, thereby providing the dispatch center with irrelevant video feeds that could detract them from their jobs during a time critical operation.

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For the new experiment in the spring of 2015, the ShotPoint sensor array system was selected as the sensor of choice, as the system was capable of covering a larger area of the school as a completely separate system, but still capable of interfacing with the school's existing video security system as well as Active911's mobile alerting system.

The school floorplan was reviewed and divided into sectors that corresponded to the field of view for each of the 62 installed cameras. The ShotPoint application was updated to transform the standard shooter location message into a corresponding camera ID.

AlphaCorp Security Inc. created a service that would run on the security server and make use of the application programming interfaces for the ShotPoint and the ExacqVision video security system. In May 2015, Databuoy installed ShotPoint sensors in the school for a long-term evaluation and began monitoring background noise and making tiny adjustments to the system gain.

On June 1, Sandcreek students were dismissed while personnel from the city, the school district and sheriff's office moved in for a live test. The test was timed to coincide with a stage presentation at the Global City Teams Challenge event in Washington, DC that featured a live broadcast of two shooters firing AK-47 rifles inside the school.

In less than 3 seconds, the ShotPoint system located the shooters, cued the correct cameras and live video streams were pushed across the network to the dispatch center. The emergency dispatcher captured images of both shooters and transmitted them to the first responders over the Internet. The entire sequence occurred in less than half a minute. The test images are compelling examples when viewed next to security camera footage from the Columbine and Navy Yard shootings. Undoubtedly, lives can be saved if responders have accurate location data and images in seconds and not days.

Patterson, Ashcraft and all those involved from the Bonneville County School District and Bonneville County Sheriff's Office demonstrated an important use of intelligent edge devices in terms of enhancing public safety. The existing 911-call system not only injects delays into the response timeline, incomplete and inaccurate information puts the public and first responders at greater risk.

Captain Sam Hulse, an advocate of the new technology, stated that, "This technology can save lives by reducing the response time and by giving clear and concise information. You can get a description of what the shooter looks like, where they are, how many there are and in what direction they're going."

"If [an active shooter event] were ever to happen, why not be as prepared as you can be," explained John Pymm, Bonneville Joint School District 93 Director of Safe Schools.

The next steps can be described as an iterative, systematic approach to making real time public safety communication systems a reality. The remainder of 2015 and beyond will include long-term testing of the ShotPoint shooter localization and cueing system, efforts to further increase accuracy and reliability of the system, bringing on more "intelligent edge" devices, and possibly expanding the network with additional local video connections to the response center.

Bruce Patterson is technology director for the City of Ammon, Idaho who has worked for the city since 2004. He's currently responsible for the city's technology systems, including the ongoing build out and implementation of a municipally owned fiber optic system.

Kathleen Griggs, president of Databuoy LLC., has over 28 years of experience in Department of Defense sponsored research and development programs. She has led Databuoy through the development and fielding of ShotPoint since 2006.

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