SHOTPOINT in Annapolis, MD Case Study Report

▸ Databuoy Corporation and Itron, Inc. partner to deploy gunshot detection

▸ Results show how immediate intelligence helps the police

SHOTPOINT can be deployed over utility networks to bring immediate situational awareness that helps responders

Utility companies are the backbone of communities and own a key role in the the smart city of the future. Old-fashioned streetlights are being connected with mesh communications and are a path for municipalities to build out the smart cities of the future. Street poles, with power, and wireless communications, make them the best place to extend smart sensors into communities and create new services including those that support public safety.

In the Spring of 2020, Itron, Inc. and Databuoy Corporation launched a demonstration program to evaluate smart city sensors including those that support gunshot detection. The project set out to determine whether the SHOTPOINT sensor networking technology was reliable, effective, supportable, and whether it offered a measurable benefit to the community. The project was supported by the local utility in the City of Annapolis, MD and utilized the street lights for mounting and powering the system.

After a period of initial development and integration, the demonstration showed that SHOTPOINT technology can successfully operate over the intelligent lighting network. The results substantiated how SHOTPOINT enables more precise policing with automated intelligence and fast notifications.

SHOTPOINT notably improved police response times and investigative actions and was shown to be a valuable commodity for the community.
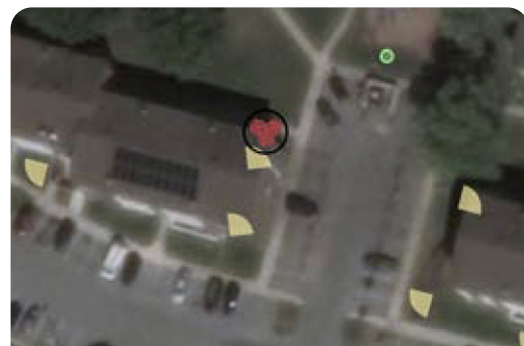
> **"**
>
> This technology helps my officers do their job and we're all in.
>
> Investigator Tim Hall, Annapolis PD

SHOTPOINT deployment focused on an area that has been hit hard by gun violence

The Smart City Vision

The Utility shared Databuoy's and Itron's vision for connected communities provided hands-on participation through every stage of the effort to confront a safety challenge for Annapolis, and laid the partnership groundwork to have the Annapolis Police Department (APD) take full ownership to monitor the system. The utility's support in seeing the project through to success, and their vertical infrastructure expertise was invaluable.

A demonstration deployment with lives at stake

Two housing complexes inside the City of Annapolis, MD, were selected for the demonstration. These were the Harbor House and Eastport Terrace apartments. These housing complexes represent a community that struggles with gun violence. Police and community activists have experienced frustrations with unabated shootings and the many unsolved crimes.

Difficulties faced by police include the reluctance of witnesses to these crimes to tell police what they know out of fear of retaliation or simply wanting to avoid getting involved.

Annapolis Police Chief, Ed Jackson, was quoted as saying, "The lack of trust between police and residents erodes their ability to solve crimes that would, in turn, create a better relationship with the community." Existing gunshot detection technology alerts police to possible shootings, but does not offer the capability to help identify shooters.

Databuoy's SHOTPOINT technology is 100% automated with such precise location that, when combined with video feeds can provide additional intelligence about the suspected shooter. SHOTPOINT's immediacy in reporting enables police to get to the exact location rapidly for the best chance of apprehending the shooter.

> ## SHOTPOINT, utilizing the Itron Mesh Network, works reliably and aids in precision policing

SHOTPOINT offers a precision solution to gunfire localization

SHOTPOINT is a precision gunfire detection and localization solution that resolves shots with better than 2 meter accuracy and transmits the shot reports in less than 2 seconds. Shot reports can be sent to both web and mobile users.

The reports allow the users to quickly see the location on a map; they include a short audio clip of the shot event and images from the exact moment of the shot taken from the camera view nearest to the shot location.

SHOTPOINT's technology removes false alarms caused by triggers such as vehicle back fires and other environmental noises. SHOTPOINT distinguishes fireworks activated inside the network and transmits firework reports separately from shot reports.

Initial goal was to operate on the Itron utility network

The key to the mutual success of the Databuoy and Itron partnership was to prove out the SHOTPOINT system on the Itron network. Could a realtime, life-safety system

operate over a network built for meter reading and lighting control? Could the system transmit audio files of gunshots fast enough for responding officers to listen? Results demonstrated that all the real-time SHOTPOINT features and stated precision were available over the Itron mesh network.

Technical challenges were readily overcome

The physical sensor layout included placements with roughly 60m spacing. The SHOTPOINT sensors communicated via a proprietary sensor network and connected through the Itron mesh network to reach the cloud.

The implementation was straightforward. Initial concerns about the potential for network delays fortunately did not materialize.

System updates happened in stages

The system evolved through several phases as the full capability of the SHOTPOINT system was integrated with the Itron Edge Gateway and implemented.

The overall results were confirmation that the shot detection messages and sensor monitoring functions operated reliably. Throughout this process the system was live and police monitored the reports and checked their accuracy and reliability.

It was determined early on that the connection to the Itron network was stable and could support the immediate transmission of shot detection and ocalization functionality without compromising performance. The shot location functioned within the stated <2m accuracy and transmission of shot reports occurred in <2 seconds.
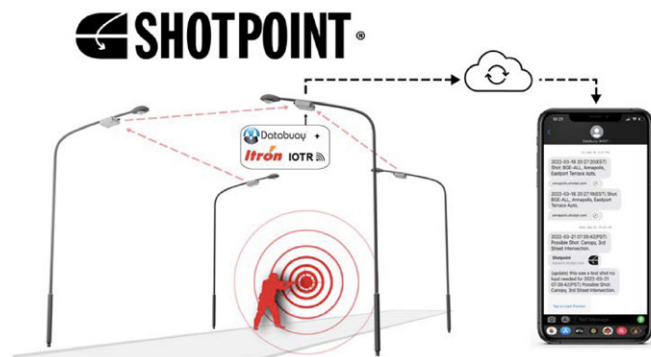
Databuoy's network monitoring software measured network uptime and latency. Aside from weather-related outages, no regular downtime was experienced.

System features that add situational intelligence worked well

Databuoy's Soundbytes™ software that attaches short audio files for users to hear the shots, after some initial modifications, performed well. Annapolis PD felt was essential to have the audio files for their situational awareness.

SHOTPOINT connected to the Qognify video surveillance system managed by the Annapolis PD. After working with the police to configure the camera view maps, the system was able to pull images and short video clips from the time of the event. The PD has plans for a major system update to improve on camera coverage.

SHOTPOINT successfully filtered other "shot like" by triggers such as vehicle back fires and other environmental noises. SHOTPOINT distinguishes fireworks activated inside the network and transmits firework reports separately from shot reports.

Telling the shooter apart from the witness changes everything

In real-world incidents the system creates real-time intelligence for responders

In the final outcome, mapping each shot location with the audio and images served to validate SHOTPOINT accuracy as shooters were often seen taking their shots at the exact location marked on the map. When the precise location and images of the shooter are combined, it is possible to identify who is and who is not the shooter.

Measuring Success

Success for the program had to be more than validating that the system functioned. The true measure of success was whether the system provided a real impact on policing. It wasn't enough to demonstrate the shot location accuracy was consistently better than 2 meters, success meant the police trusted and made use of the location information to immediately get to the incident.

Annotation of shot reports with the correct imagery is a measurable achievement, but success is measured by whether and how the police use the images for real-time identification of the suspect and differentiation between suspect and bystander. Ultimately, success is reduced fear and elevated comfort with policing among the community.

> ### It is possible to identify who is and who is not the shooter

SHOTPOINT detects shots, removes false alarms, and separates fireworks from shots

The system has been deployed for more than eighteen months. During that time SHOTPOINT properly detected nearly a dozen police confirmed shootings in the area covered by the system. The system detected nearly 1400 fireworks, most in the period surrounding July 4th. All of the events that could be confirmed from video confirmed Databuoy's 2m location accuracy goal.

The system successfully filtered all sources of false alarms including vehicle backfires and other impulsive sounds occurring in the environment. The system separates fireworks from gunfire using a machine learning technique that resulted in an overall misclassification rate of less than 10%.

The system correctly recognized all shooting incidents within the coverage areas with the exception of two incidents where shots were fired from vehicles from a direction that blocked the shot signal from the sensors. In these incidents, shots were misclassified as fireworks. The system has since been refined such that shots blocked by vehicles will more likely be correctly classified as shots.

Immediate intelligence in the hands of responders can save lives

Because SHOTPOINT is a fully automated system, instant notification becomes possible. In shooting events that evolve quickly, seconds matter in policing. SHOTPOINT's messages to officers in mobile units can direct them to the exact location of crime scene.

This response happens in the quickest amount of time possible. Annapolis PD reports indicate that SHOTPOINT information reaches their officers and initiated response anywhere from 30s to 2 minutes
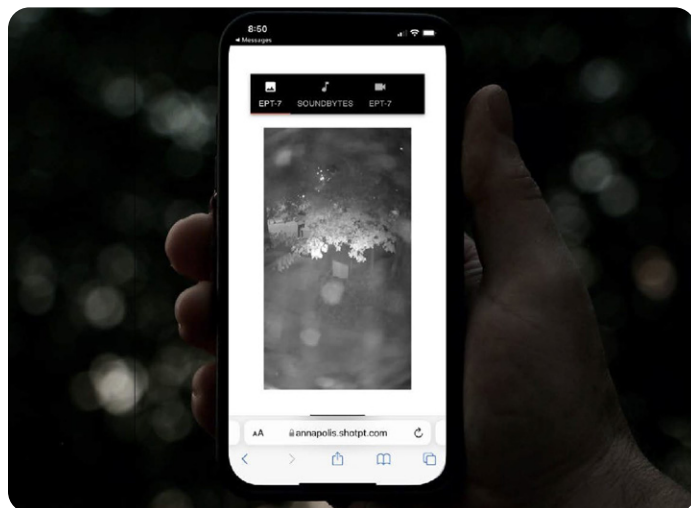
before the first 911 calls are received by Dispatch. This, combined with an image of the shooter that is capture at the shot time, often displays the shooter holding the weapon and taking the shot. This intelligence enables better apprehension of the suspect, who at times is still on the scene.

vThis can also save more lives by enabling the officer to quickly mitigate the shooter from creating more victims, and can save the life of the officer who has more information about the threat and can prepare the best tactical response.

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