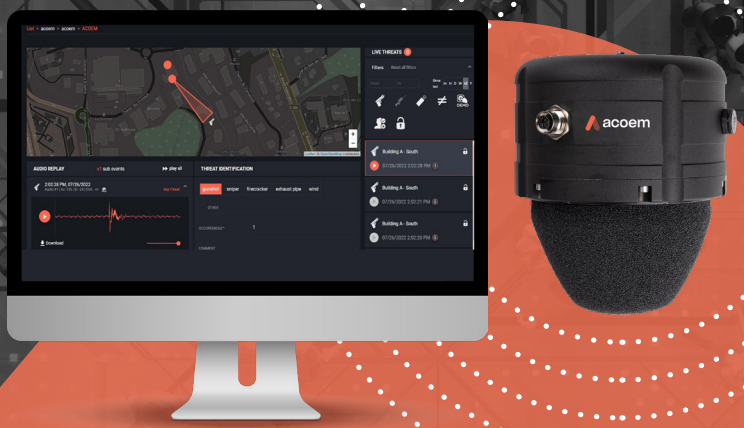
The Modern Gunshot Detection Buyer's Guide

5 Critical Questions and 3 Hidden Costs to Ask Before You Sign



acoem

ATD Technology
Leaders in Outdoor
Acoustic Gunshot Detection

Security technology has evolved Has your strategy?

For years, outdoor gunshot detection meant massive infrastructure projects: miles of cabling, heavy servers, and complex "mesh networks" and long-term contracts that required sensors to talk to each other to make a decision.

That is the Legacy Standard.
Today, the standard is Intelligent Edge Processing. Modern systems are leaner, faster, and smarter —trained on decades of acoustic data to filter out the noise of the real world.

This guide is designed to help you vet vendors, cut through the marketing jargon, and ensure you are investing in a system built for the future of security, not the past.

Who this guide is for:

Cities and towns (municipal & downtown districts)
For police chiefs and city managers moving beyond reliance on delayed 911 calls. This guide explains how to capture objective, immediate digital evidence to enhance officer safety and accelerate aid to victims.

Schools and universities (educational campuses)
For security directors tasked with securing vulnerable outdoor areas. Learn how to bridge the gap between outdoor detection and immediate response protocols, ensuring you can initiate lockdowns or shelter-in-place procedures the moment a threat is detected.

Critical infrastructure (substations & utilities)
For security operators facing long-range ballistic threats. Discover how to protect vulnerable assets from attacks that originate hundreds of feet outside your perimeter, ensuring you receive immediate alerts with verified video.

Venues and outdoor events (stadiums & festivals)
For event security monitoring expansive crowds beyond the gate. Understand...d how to extend precise threat detection into tailgating areas and parking lots where traditional perimeter security often fails.

Retail and commercial properties
For property managers overseeing sprawling, out-of-sight environments. With 52% of outdoor gunfire incidents occurring in parking lots, this guide helps you eliminate blind spots and reduce liability in large commercial spaces.

Security integrators & consultants
For partners designing modern perimeters. Learn how single-sensor architecture simplifies site design, reduces installation labor costs, and eliminates the "false alarm fatigue" that drives customer complaints and service calls.

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The vendor evaluation scorecard

Take this sheet into your next vendor meeting. If there are any checkmarks in the “Red Flags” column, proceed with caution.

The Critical Question		The Red Flag Answer (Legacy Tech)		The Modern Answer (Acoem ATD)
1. Is a mesh network required?	☐	“Yes, we need multiple sensors to triangulate the sound.”	☐	“No. We use single-sensor localization. One sensor is enough.”
2. Is the algorithm tuned for outdoors?	☐	“It works everywhere / It mainly detects loud impulsive sounds.”	☐	“Yes. It is trained on 30+ years of specific outdoor acoustic data.”
3. Is audio processed on the Edge?	☐	“No, data is sent to a server or cloud for analysis.”	☐	“Yes. AI processing happens instantly on the device (No Latency).”
4. Do you have visual verification?	☐	“We provide a dot on a map.”	☐	“We instantly slew PTZ cameras to the exact coordinates.”
5. Is it portable?	☐	“No, it requires permanent mounting and calibration.”	☐	“Yes. It is easily redeployed for events and changing threats.”

Deep dive
The power of edge-processing

Why "**where**"the math happens matters.

The biggest difference between legacy sysetms and Acoem ATD is edge processing.

Legacy (Server-Dependent)

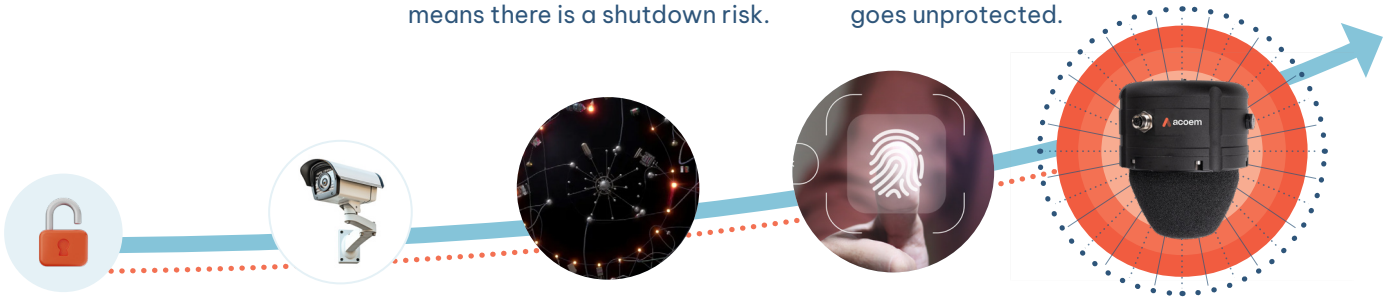
In older systems, the sensor is just a microphone. It hears a sound, compresses it, and sends this data to a central server or cloud to "ask" if it was a gunshot.

The Risk

Latency
Data travel time creates a communication delay; by the time the server identifies the shot, the shooter may have moved

Network reliability
The system is "blind" if the local network goes down, as the sensors cannot identify sounds without a server connection. This means there is a shutdown risk.

Hardware Fragility
Because these systems require 2 or more likely 3 sensors to work in unison to locate a shot, the probability of a system failure is tripled; if any single node in the cluster fails, the entire area goes unprotected.



The Evolution of Security & Gunshot Detection Technology

Modern (Edge AI)

Acoem ATD processes the acoustic data directly on the device. The sensor holds the intelligence.

The Benefit

Instant Detection
Alerts are generated the millisecond a shot is recognized, eliminating latency and providing real-time location data.

Autonomous Operation:
The system identifies threats on the device, ensuring it stays functional even if the network is intermittent.

Single-Sensor Precision
Acoem ATD-300 sensors can detect and locate a shot independently. By requiring only one sensor for a precision fix, you drastically reduce the mathematical likelihood of a hardware-related outage.

Industry insight: The shift in NERC CIP-014
Regulatory pressure on critical infrastructure is intensifying. With the evolution of CIP-014, utilities face stricter requirements to identify and protect critical transmission assets against physical attacks.

- The Challenge: Traditional perimeter security often fails to detect threats originating outside the fence line (e.g., long-range ballistic attacks).
- The Mandate: Physical security plans must demonstrate the ability to Deter, Detect, Delay, Assess, and Respond.

The Solution: Acoem ATD satisfies the "Detect" ,"Assess", and "Response" requirements by identifying gunfire instantly, even from hundreds of yards outside the perimete, and triggers PTZ verification so operators can be alerted and assess the situation before damage escalates.

The acoem advantage: Intelligence at the edge

Acoustic environments are complex and constantly changing.

To provide actionable intelligence rather than just "loud noise" alerts, Acoem utilizes a proprietary sensor architecture that combines decades of acoustic research with modern Artificial Intelligence.

1. Dual-Verification: The Gold Standard

A gunshot is not a single sound; it is a complex physical event. Most legacy sensors only listen for a "Blast," which can be easily mimicked by fireworks or mechanical failures.

- **The Muzzle Blast:** Our sensors capture the omni-directional "boom" caused by expanding gases at the barrel.
- **The Ballistic Shockwave**: We simultaneously listen for the supersonic "crack" generated as the bullet breaks the sound barrier.
- **Mathematical Correlation:** Acoem's algorithms can confirm a gunshot based on either the muzzle noise or the ballistic shockwave, ensuring unmatched accuracy even in close-range scenarios where the Muzzle Blast signal is masked or overtaken by the higher-intensity Shockwave.

2. Edge Processing & Onboard AI

Seconds matter during a ballistic event. While other systems may rely on centralized processing, Acoem sensors perform heavy-duty analysis directly on the device.

- **Instant Analysis:** By processing the waveform signature at the "edge," we provide immediate alerts and instant slewing of the associated PTZ camera, providing audio and video for real-time situational awareness.
- **Smart Filtering:** Our onboard AI is trained on 30 years of acoustic data, allowing it to distinguish gunshot events from other environmental sounds and isolate the threat in real- world conditions.
- **Continuous Improvement**: Every acoustic event captured by ATD sensors contributes to the continued training and improvement of the AI model.

3. Precision Through Heritage

Accuracy in gunshot detection requires expertise in both hardware and analysis

- **The Solution:** Acoem's 30-year acoustic heritage provides a massive dataset of pre recorded sound files used to train our AI, and a state-of-the-art hardware perfected over multiple generations of gunshot detection solutions.
- **Real-World Reliability:** The ATD-300 features a unique 4-microphone head that analyzes microsecond signal delays to determine the exact line of sight (Azimuth/Elevation) to the shooter. This combined with deep expertise in acoustic analytics ensures the system remains highly sensitive to genuine threats while maintaining best-in-class reliability.

The anatomy of an acoustic event

To distinguish a gunshot from other "loud" acoustic events, such as a car backfire or a heavy door slamming, a modern detection system can't just "listen" for loud noises. It must analyze the unique acoustic fingerprint of a ballistic event across three specific dimensions:

The Muzzle Blast (The "Boom")

When a firearm discharges, the rapid expansion of gases produces an impulsive sound wave.

- **Why it Matters:** Unlike vehicle or construction noise, which produces a continuous or rhythmic sound, a muzzle blast produces a high-intensity impulsive wave with a significant low-frequency component and a near-instantaneous rise time (<1 ms) which decays exponentially.
- **The Analysis:** Modern systems analyze many features of the Waveform Envelope, such as rise time (how fast the sound reaches its peak), peak overpressure, decay rate, positive phase duration and the spectral content (frequencies present) allowing the system to discriminate between the specific acoustic energy of a firearm and non-ballistic impulsive noise.

The Supersonic Shockwave (The "Crack")

Most modern ammunition travels faster than the speed of sound. This creates a "ballistic crack" or "Mach cone" as the bullet passes through the air.

- **Why it Matters:** This phenomenon creates a distinctive "N-wave" pressure profile, a sharp rise in pressure followed by a rapid drop, perceived as a high-frequency "crack." This is a definitive "fingerprint" of a bullet. Mechanical noises (like a firework) lack this specific supersonic signature.
- **The Analysis:** Modern systems have the ability to identify the time-difference between the **Muzzle Blast** and the **Shockwave** to refine the detection accuracy.

3. Acoustic Propagation & Echoes

In real-world environments, sound bounces off walls, hills and roads. This is known as multipath interference.

- **Why it matters:** Simple decibel-meters get confused by echoes, leading to false locations.
- **The Analysis:** Sophisticated systems employ a time windowing to filter out "multipath" interference, ensuring the system identifies the actual source of the shot rather than a reflection.

- **The Bottom Line**

Relying on Decibels (Loudness) alone creates a "noisy" system prone to false alarms. True reliability comes from Acoustic Pattern Matching: identifying the specific characteristics of a soundwave and comparing it to the acoustic signatures of gunshots and other environmental noise. Success requires top-of-the-line sensor hardware, large data-sets of pre-recorded sound files, and deep expertise in the science and analysis of acoustics.

The 3 hidden cost questions

Protect your budget by asking these questions before the contract is signed.

To provide actionable intelligence rather than just "loud noise" alerts, Acoem utilizes a proprietary sensor architecture that combines decades of acoustic research with modern Artificial Intelligence.

Q1 "What is the maintenance calibration plan?"

- **The Trap:** Legacy systems often drift, requiring frequent and unpredictable manual recalibration and expensive, unplanned truck rolls just to keep them working.
- **The Acoem Advantage:** Our system features continuous Remote Health Monitoring. This allows your integrator to proactively verify system uptime and performance remotely, ensuring your security is active 24/7 without the disruption of constant on-site repairs.

Q2 "Who owns the data?"

- **The Trap**: Some vendors claim ownership of your acoustic data to help train their own AI, sometimes charging you to access your own historical logs.
- **The Modern Standard:** You bought the system. You should own the intelligence it generates.

Q3 "What is the true hardware-to-coverage ratio?"

- **The Trap:** Legacy mesh systems rely on triangulation, often requiring you to purchase, mount, and cable multiple sensors just to cover a single zone. It's the ongoing costs for manging these systems that can create significant costs.
- **The Acoem Advantage:** Because the ATD-300 uses single-sensor localization, one device covers the entire area. You run one cable instead of five. Less hardware = Lower install cost.

Integration Readiness

Does it play nice with your current tech?

A modern sensor shouldn't just alert you; it should trigger a workflow as part of a layered security strategy. Acoem ATD is built on open standards to integrate seamlessly with your existing security ecosystem.

Key integration capabilities include:

- **VMS Integration:** Connects easily with major platforms (like Milestone and Genetec) to automatically tag and bookmark video upon detection, ensuring instant access to the event without searching through hours of footage.
- **Camera Automation**: Uses ONVIF protocols to instantly slew PTZ cameras to the exact coordinates of the threat.
- **Automated Responses:** Can be configured to trigger optional workflows—such as activating loudspeakers, IR illuminators, lighting, or LPR capture—depending on your specific security protocols.

Scalability and architecture

Grow at your own pace.

Legacy systems often treat security like a construction project—requiring complex site surveys, trenching for cabling, and heavy server installation to support a mesh network. For example, to cover a parking lot, you need a web of sensors communicating with each other. If you want to expand later, you often have to re-calibrate the entire network.

Acoem treats it like a tactical deployment. Because our edge-processing architecture eliminates the need for a mesh network or complex server back-ends, the path from "purchase" to "protection" is drastically simplified.

The Acoem Advantage: Modular Growth

- **Start Small:** Secure a single high-risk gate or parking lot today with just one or two sensors.
- **Expand Easily:** Since every sensor is independent, you can expand your perimeter next year without re-engineering or re-calibrating a complex mesh web.
- **Mobile Flexibility:** Our technology is also available as a rapid-deployment portable solution. This allows you to secure temporary events or construction sites with the same precision and user interface as your permanent installation.

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Readers' Choice
Honorable Mention
(Threat Detection)

2025 SIW SECURITY INFOWATCH.COM READERS' CHOICE AWARDS

- **The Standard in Outdoor Acoustic Gunshot Detection**

Acoem ATD isn't a startup. We are the commercial, evolution of proven military technology—systems originally designed to locate sniper fire in the world's most demanding combat zones. When we say "Verified," we mean verified in the field, not just the lab.

How the ATD system works: 5 phases of protection

The ATD System transforms threats into real-time, actionable intelligence.

Its innovative AI neural network processes signals directly within the sensor itself (edgeprocessing), ensuring rapid response when seconds matter.

- **Cover:** A single atd sensor covers an unparalleled 500 foot radius (1000-foot diameter). This means fewer sensors are required to cover wide outdoor spaces compared to other solutions, reducing hardware footprint, installation labor and ongoing maintenance costs.
- **Detect & locate:** The sensors ai neural network instantly detects and locates a gunshot and precisely processes acoustic signatures, distinguishing actual gunshots from false alarms like fireworks or car backfires directly at the edge. This means fast information with significantly reduced false positives.
- **Alert & slew:** An audio alert is instantly sent, and the sensor commands a PTZ camera to capture video evidence. This visual verification happens in real-time.
- **Respond:** Your operations team verifies the audio alert via cadence software—seamlessly integrated into your vms—followed by instant video validation. This streamlined workflow allows security teams to act with speed and absolute confidence.
- **Adapt:** The system is easily scalable to expand coverage areas and can be used as a portable option for temporary monitoring.

The lingo cheat sheet

Don't let the jargon confuse you.
Here is what the terms actually mean.

- **Acoustic Threat Detection (ATD):** The modern category of security technology that identifies firearms through sound. Note: Also the name of Acoem's flagship system, which incorporates 30+ years of acoustic expertise to filter out environmental noise.
- **Ballistics:** The science of projectile motion and impact. In detection terms, this refers to the supersonic shockwave created by a bullet in flight. Why it matters: Advanced systems (like Acoem) detect this "crack" to verify a gunshot, while legacy systems can miss it.
- **Edge Processing:** Analyzing data locally on the sensor (Fast) rather than sending it to a cloud server (Slow). Also referred to as edge computing. Why it matters: It guarantees zero latency and ensures the system works even if the network goes down.
- **False Negative:** When a real gunshot occurs but the system fails to detect it. The Reality: This is the most dangerous failure mode, often caused by sensors that can't hear "quiet" or suppressed rounds.
- **False Positive:** When the system alerts on a non-threat, such as fireworks, construction noise, or car backfires. The Reality: High false positives cause "alert fatigue," leading security teams to ignore the system. Waveform analysis is the key to preventing this.
- **Latency:** The delay between the gunshot and the alert. Cloud-based systems have high latency; Edge systems have near-zero latency.
- **Mesh Network:** A legacy architecture where multiple sensors must "vote" to locate a sound. Requires more hardware and installation time.
- **Muzzle Blast:** A very brief, high-intensity noise created by the sudden and rapid expansion of gasses from the barrel of a firearm. Why it matters: Accurate detection requires distinguishing this specific blast signature from similar sounds like fireworks.
- **PTZ Slew:** Automatically rotating a Pan-Tilt-Zoom camera to look exactly where the sound came from to provide visual verification of an audio alert.
- **Waveform Analysis:** Identifying a threat by the shape of the sound wave, not just the volume. This is the key to preventing false alarms.

Your questions answered

Here's our responses to a few top frequently asked questions (FAQs) asked about the ATD System.

Q1: What is Acoustic Threat Detection?
A: Acoem's AI-powered ATD-300 Sensor is a key part of our gunshot detection system. The sensor was designed from inception to instantly detect, locate, and record gunshots, providing immediate audio and visual alerts through your existing PTZ camera and VMS system for immediate situational awareness.

Q2: How does ATD send an alert?
A: An ATD alert can send information directly from the edge (via edge-processing), reducing false positives and ensuring precise threat identification and localization, giving responders the ability to react immediately with maximum situation awareness for improved decision making.

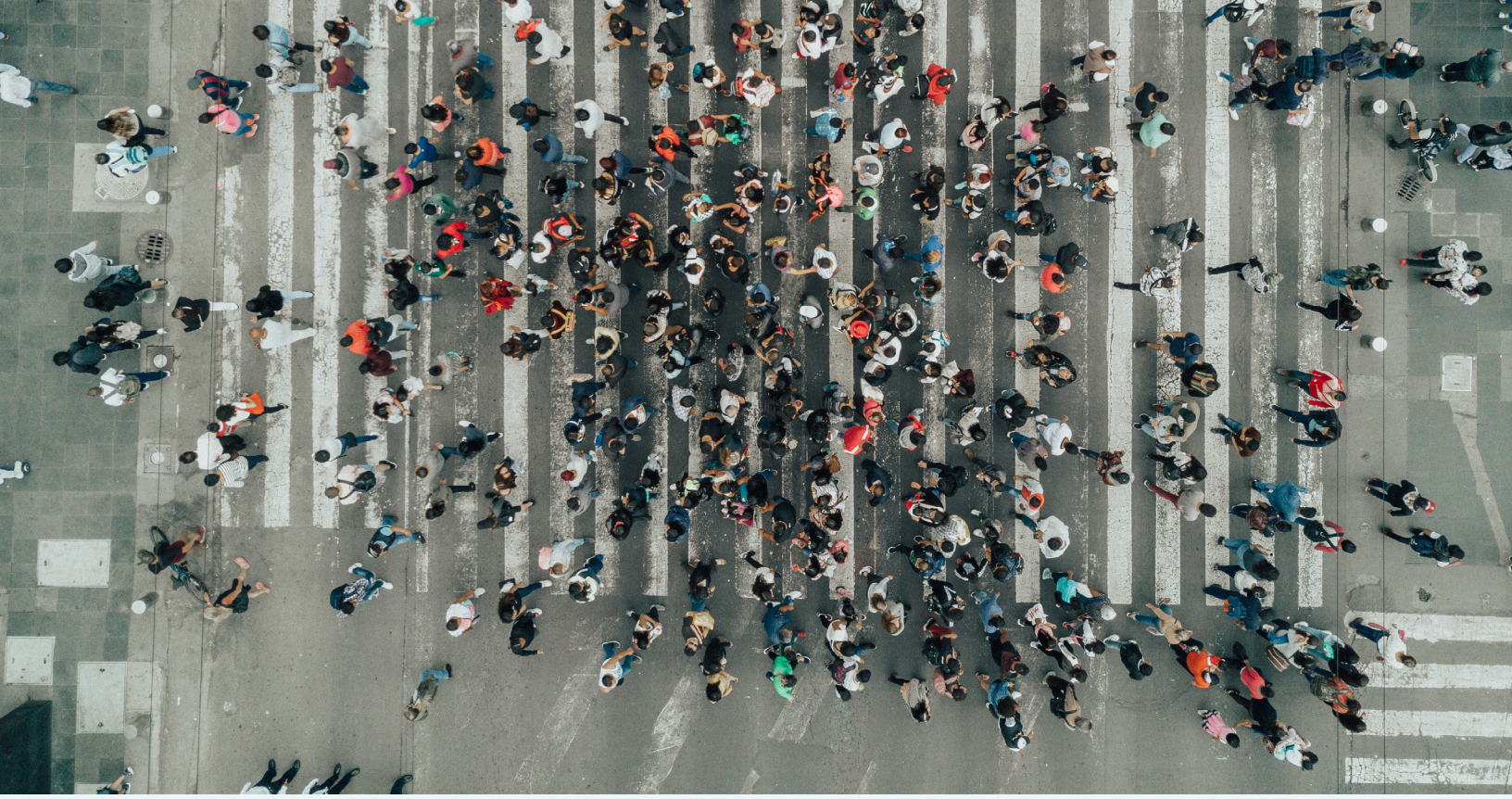
Q3: How does ATD detect a threat?
A: The ATD system uses acoustic sensors and AI to analyze sound frequencies in real-time. It learns the baseline noise of the environment and triggers alerts upon detecting the unique acoustic signature of a gunshot

Q4: Does ATD record audio at all times? How does it ensure privacy?
A: No, Acoem's ATD system records a brief 1.5-second audio clip only upon detecting gunshots. Our AI filters out typical background noise, including conversations, vehicle noise, and other environmental sounds, and doesn't allow continuous monitoring. This design prioritizes privacy and minimizes data/power use.

Q5: How many sensors do I need?
A: You can monitor your area effectively with just a single Acoem ATD sensor that covers a radius of ~500 feet (785,000 sq ft). There's flexible mounting options, and unlike multi-sensor systems, ours works effectively with just one – no minimum required!

Q6: Is this proven technology?
A: Leveraging over 30 years of military acoustic expertise and a significantly large gunshot sound library built through this experience, Acoem's proven ATD system detects gunshots with advanced AI, recording a brief 1.5-second audio clip for verification. This proven technology, now available for civilian use, offers superior reliability from a single sensor.

Q7: What does an Acoem ATD system cost?
A: Packages are customized to meet your needs. We recommend anyone interested talk with us, so we can find out what is needed and provide a live demonstration and/or quote.



Security decisions should be black and white

In an industry filled with noise, Acoem provides clarity. By choosing an edge-processing, single-sensor setup, you're not just choosing hardware. You're investing in a verified timeline that gives your team the seconds they need to act with confidence to mitigate a threat.

Don't guess. verify.

Ready to see how Acoustic Outdoor Gunshot Intelligencee with Acoem's ATD System works in the real world?

Scan the QR code to see the ATD System in action.

Are you a consultant or Integrator?

Don't just install sensors; build a practice around reliable outdoor gunshot detection. We offer a dedicated Partner Program with expert site planning, marketing resources, and protected margins.

Schedule a strategy call directly with Ed Brennen

ATD Business Development Manage
calendly.com/edwin-brennen-acoem

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CREATING ENVIRONMENTS OF POSSIBILITY

Reach out to **acoemATD.com** to discover how Acoem's Acoustic Threat Detection system is protecting communities worldwide.