Eagle Eye Application Note - AN092

Best Practices for Eagle Eye Gun Detection

2025-10-09 Revision 1.0

Target Audience

This Application Note is intended for installers, technicians, and system designers who will configure and install Eagle Eye Gun Detection, a live video surveillance analytic that can detect most brandished guns in near real-time and operates in conjunction with the Eagle Eye Cloud VMS. This application note provides best practices regarding camera specifications, placement, and analytics configuration.

Introduction

Eagle Eye Gun Detection is an advanced video intelligence solution designed to detect brandished firearms in real-time through video surveillance feeds. By leveraging state-of-the-art AI models, computer vision, and cloud intelligence, the solution enables organizations to identify and respond to potential firearm threats.

This analytic is not intended to replace traditional safety measures but rather to serve as an additional layer of protection in a comprehensive security strategy. Accuracy and Latency: Critical Factors in Gun Detection

In firearm detection, two factors are absolutely critical:

1. **Accuracy** – False positives can cause unnecessary panic and strain emergency resources, while false negatives may leave a threat undetected.
2. **Latency** – Delays of even a few seconds can significantly reduce the ability of first responders and site personnel to intervene. By proactively monitoring live video streams, Eagle Eye Gun Detection helps customers gain valuable seconds or minutes of response time that can save lives in an active shooter situation or prevent unauthorized firearm use in sensitive environments.

Eagle Eye Gun Detection's architecture is designed to prioritize both, thus ensuring reliable detection while keeping alerts fast and actionable.

Three Layers of Verification

To achieve the right balance of speed and reliability, Eagle Eye Gun Detection uses a triple-layered verification pipeline before an alert is escalated to the customer:

Edge AI Detection (AI-Bridge)

The AI-Bridge, an edge gateway device with built-in AI compute power, continuously analyzes live video feeds from connected cameras. When the model detects a potential brandished firearm, it generates an event. Running this model locally ensures low latency and near-instant detections without relying on the cloud for a first-pass analysis.

Cloud AI Verification

Detected events are sent to the Eagle Eye Cloud, where a more sophisticated, resource-intensive AI model reanalyzes the images. This second pass dramatically reduces false positives by confirming whether the object is indeed a firearm. The cloud layer benefits from access to larger models, continuous updates, and pooled learning across all deployments, further improving accuracy.

Human Review Service (HRS)

Even with strong AI, context matters. Therefore, every confirmed firearm event is reviewed by Eagle Eye's 24/7 Human Review Service team. Trained operators quickly evaluate the clip, verifying if it is genuinely a brandished firearm or a benign object (e.g., a tool, phone, or toy). Only after HRS confirmation is an alert escalated via the customer's defined call tree. Refer to Figure 1 for an overview of the three-layer verification process.

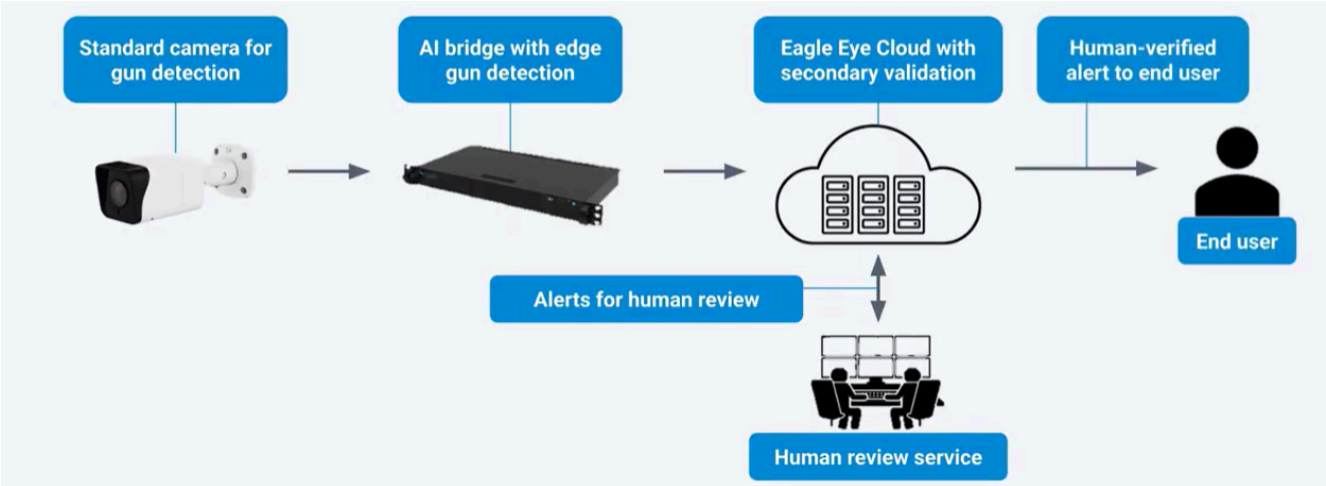


Figure 1: Three-Layer Verification Overview

Benefits of the Three-Layered Approach

- **High Confidence Alerts:** False positives are minimized through layered verification, ensuring that alerts are meaningful and actionable.
- **Fast Response:** Edge processing enables rapid initial detection, while cloud AI and HRS verification prevent unnecessary delays.
- **Operational Efficiency:** Security teams and first responders are only engaged when a verified threat exists, reducing fatigue and liability, while increasing trust in the system.
- **Scalable Accuracy:** The cloud layer enables continuous updates and improvements to the detection models, thereby enhancing accuracy over time.

Gun Detection: A Layer of Security, Not a Cure-All

Eagle Eye Gun Detection is a key component of a **layered security strategy**, designed to enhance situational awareness and help mitigate the severity of firearm-related incidents. No single technology or policy can prevent all threats, but when combined—access control, trained personnel, surveillance, and emergency response protocols—they create a more resilient and effective safety framework.

A Proactive Layer of Protection
Traditional video surveillance is reactive, reviewed only after an event occurs. Gun Detection makes cameras proactive, identifying visible firearm threats in real time and enabling faster, coordinated action to reduce potential harm. This early detection provides critical awareness, allowing organizations to implement protective measures sooner.

Accuracy Through Verification
Unlike conventional motion or acoustic systems, Eagle Eye Gun Detection uses a multi-layered process—edge AI, cloud AI, and Human Review Service (HRS)—to confirm alerts before escalation. This minimizes false positives and ensures alerts are accurate and actionable.

Complementary to Existing Measures
Gun Detection works alongside other security tools such as metal detectors, visitor management systems, and access control. While metal detectors identify concealed weapons at controlled entry points, Gun Detection provides visibility in open or uncontrolled areas like parking lots and approaches. It functions much like a fire alarm—detecting early, reducing risk, and helping limit the impact of potential threats.

Hardware & Infrastructure Requirements

The correct hardware and infrastructure are essential to ensure the system works as designed. Review the prerequisites for gun detection analytics.

Bridge/CMVR:

Eagle Eye's Gun detection first layer of AI is performed on the edge of a Bridge/CMVR. As compute power is a requirement, gun detection is only supported on specific AI bridges

Bridge/CMVR Model	Total Number of Cameras	Camera with gun detection analytics
Eagle Eye Bridge 401ai/420ai	20	5

Cameras:

Camera selection and installation is critical for analytics to perform reliably

Specification	Short Range	Long range
Resolution	4 MP or better	
Frame per second	12 FPS or better	
Lens	2.8–12 mm	8–32 mm or 5–50 mm
Image enhancement	Low light imaging, HDR, day & night operation control	

*PTZ, fisheye, and panoramic cameras are **not recommended** for consistent AI detection.

Recommended Eagle Eye Networks Cameras

Eagle Eye camera models recommended for use with Eagle Eye Gun Detection are:

- Eagle Eye DB11 Indoor/Outdoor 4MP Bullet IP Camera, 2.7-13.5mm Moto Lens
- Eagle Eye DB13 Indoor/Outdoor 8MP Bullet IP Camera, 3.3–12mm Moto Lens
- Eagle Eye DD08 Indoor/Outdoor 4MP Vandal Dome IP Camera, 2.7-13.5mm Moto Lens
- Eagle Eye DD09 Indoor/Outdoor 4MP Vandal Dome IP Camera, 2.7-13.5mm Moto Lens
- Eagle Eye DD11 Indoor/Outdoor 8MP Vandal Dome IP Camera, 3.3-12mm Moto Lens
- Eagle Eye DT02 Indoor/Outdoor 4MP Turret IP Camera, 2.7-13.5mm Moto Lens

Network and Connectivity Considerations

The performance of Eagle Eye Gun Detection depends not only on AI accuracy and human review but also on reliable network connectivity. Since the system uses both edge AI processing and cloud verification, sufficient bandwidth and low latency are essential for timely alerts.

For a reliable connection, it is recommended to use **Gigabit switches**.

Internet Speed and Bandwidth
Each camera adds to the network load. While the AI-Bridge handles most processing locally, short video clips and metadata must still be uploaded to the Eagle Eye Cloud for verification and alerting.

- Allocate a **minimum of 8 Mbps per camera** for high-definition video.
- Bandwidth requirements may vary based on frame rate, resolution, and retention settings.
- On shared networks (e.g., with staff or student Wi-Fi), ensure surveillance traffic is prioritized over high-usage apps like Zoom or streaming services.

Latency and Delays
When internet bandwidth is saturated, event uploads and alert notifications can be delayed—reducing available response time during critical events. To prevent this:

- Reserve or prioritize bandwidth for video surveillance and AI traffic.
- Ensure a **stable and low-latency connection** between cameras, the AI-Bridge, and the cloud.

Reliability and Redundancy
To maintain uninterrupted operation:

- Use **dual ISP connections** (fiber + LTE/5G) to provide failover protection.
- Provide **UPS power backup** for cameras and network equipment.
- Periodically **monitor bandwidth utilization** to identify and address bottlenecks before they impact performance.

Camera Installation Best Practices

Optimal camera installation is crucial for accurate gun detection analytics. This section outlines the recommended installation practices.

Refer to the table below for camera imaging requirements for reliable gun detection.

Specification	Requirement
Minimum pixel requirement for person detection	128×256 pixels (Height × Width)
Minimum pixel requirement for the gun to be detected	50×50 pixels (Height × Width)

Maximum width of view	30 feet/ 10 meters
The percentage of the gun that is visible for the gun to be detected	70% of the gun is visible to the camera
Operational model and minimum illumination for the area	Day and night operation in color mode Minimum of 100 Lux required for gun detection

To achieve the required resolution for gun detection, the field of view is limited to 30 feet, and the camera should be zoomed and focused on the target. Figure 1 below provides a reference image for how it should be measured.

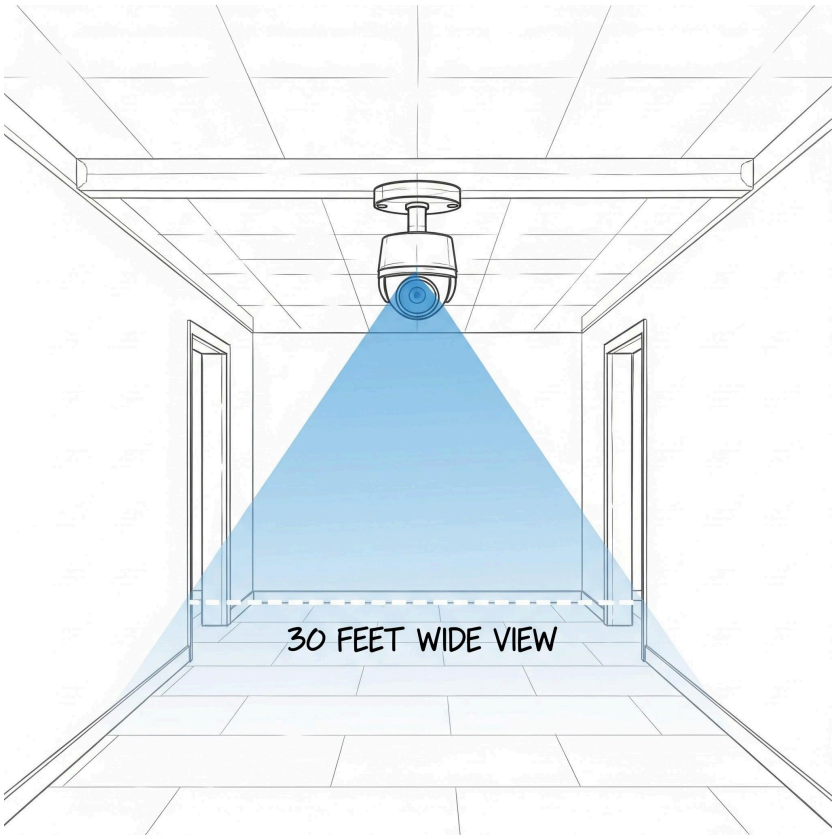


Figure 1: Reference Image for Camera Distance Measurement

Please refer to Figure 2 for an example of someone using gun detection in a lobby. As the gunman crosses the red line in the image and moves towards the camera, he enters the zone where the AI can reliably detect the gun.

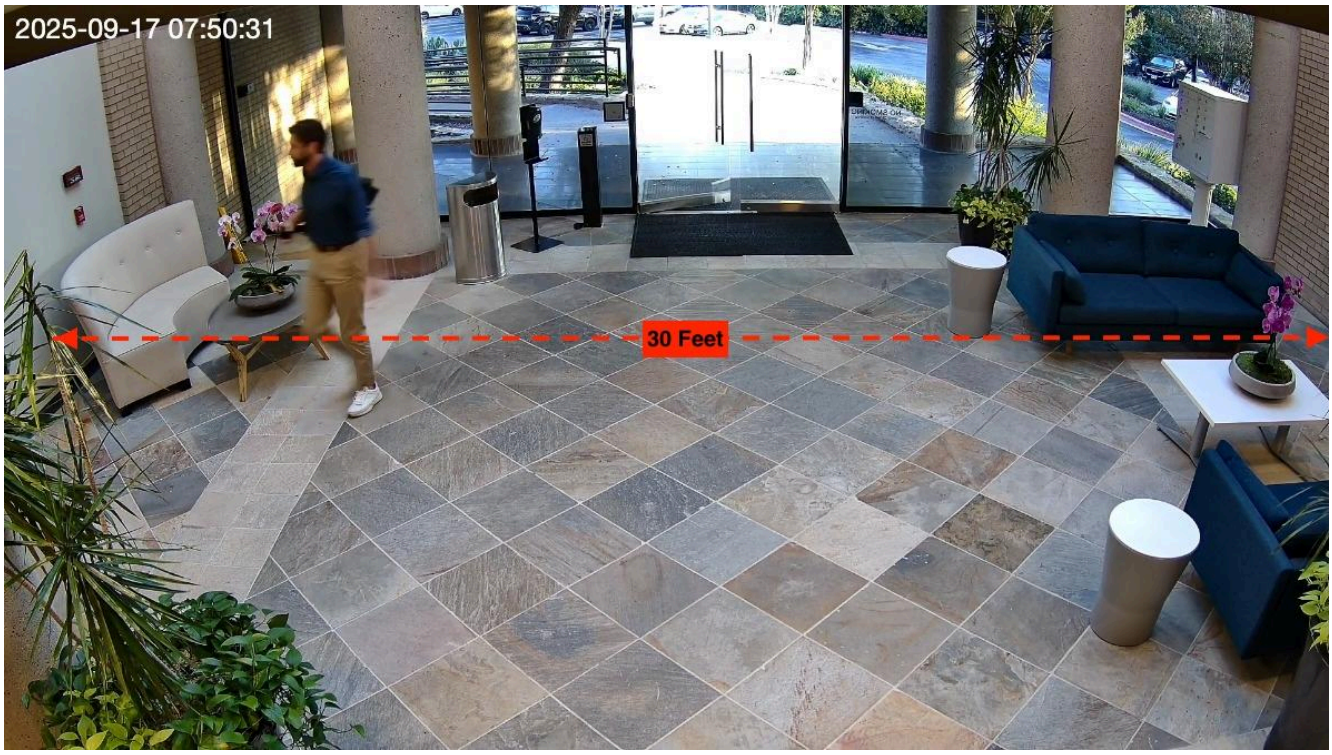


Figure 2: Eagle Eye Gun Detection inside a 30-foot wide field of View

Increasing Detection Accuracy by Using Two Cameras

To improve the probability of not missing a gun detection due to occlusion, a customer can deploy two cameras 10 feet apart, as shown in Figure 3 below.

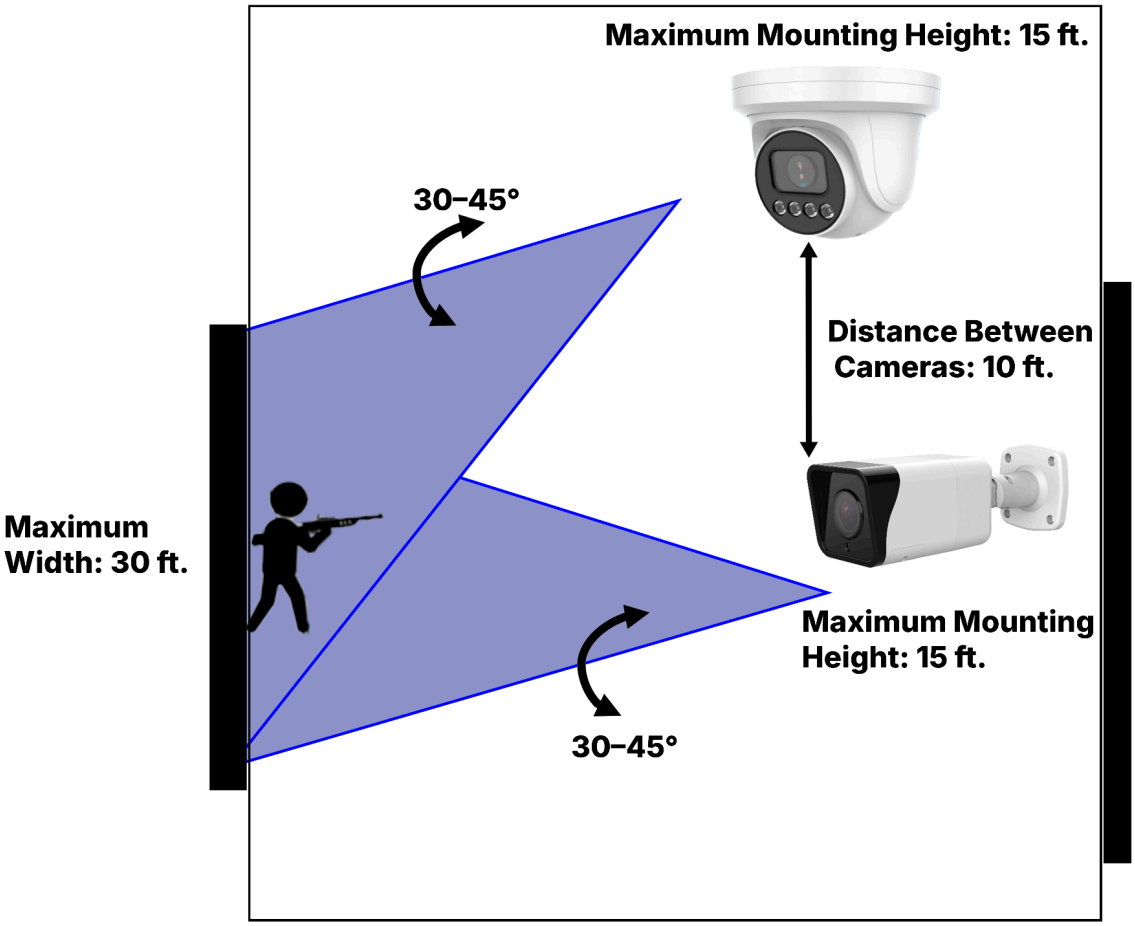


Figure 3: Eagle Eye Gun Detection with Two Cameras

The depicted installation utilizes two cameras to monitor a specific area. This dual-camera setup enhances gun detection, particularly when someone attempts to conceal a weapon from a single camera's view.

Areas Ideal for Gun Detection Installation

Gun detection analytics are most effective when deployed in *approach zones* rather than crowded indoor areas like cafeterias or auditoriums. The following locations provide the best coverage and response advantage.

Entrances and Exits
These are the highest-priority areas, as they serve as choke points where weapons are most likely to be brandished.

- **Indoor-Facing Cameras:** Positioned just inside the doorway for clear, controlled views of people entering.

- **Outdoor-Facing Cameras:** Mounted outside entryways to detect threats before access is gained; must be weather-rated and positioned to avoid glare.
  Recommendation: Use both indoor and outdoor coverage for redundancy and faster detection.

Approaches (Parking Lots and Entry Paths)
Approach cameras extend detection beyond entrances, creating an early-warning zone that can identify a visible firearm seconds before entry. This allows time for actions such as alerting security, triggering door locks, or activating PA announcements. Cameras should capture clear chest-to-hand views without excessive zoom.

Interior Coverage (Passageways)
After entrances and approaches are covered, cameras can be added in interior areas such as hallways, stairwells, and elevators. These locations maintain visibility if a threat bypasses exterior layers or brandishes a weapon after entering.

Implementation Service

The Eagle Eye Gun Detection implementation service is designed to ensure that every deployment meets technical, operational, and response-readiness requirements. The process is executed in four structured stages that guide the customer from installation to live operation.

Stage 1 – Installation Validation

In this stage, the Eagle Eye implementation team works closely with the reseller or security integrator to validate the physical installation and system readiness. Activities include:

- Verifying that cameras meet the recommended image quality, field of view, and lighting conditions for reliable detection.
- Ensuring the correct positioning of entrance, exit, and approach cameras as per Eagle Eye guidelines to achieve optimal coverage.
- Confirming network setup, bandwidth availability (minimum 8 Mbps per camera), and AI-Bridge connectivity for real-time data transfer to the Eagle Eye Cloud.
- Checking that camera streams are stable, properly configured, and visible in the Cloud VMS.

This step ensures that the installation meets all technical prerequisites before configuring analytics and alert workflows.

Stage 2 – Escalation Path Definition and Configuration

Once installation validation is complete, the implementation team engages the customer to

define the escalation path and response workflow.

During this stage:

- The escalation path is documented in detail, including the sequence of contacts (call tree), preferred alert methods, and the roles of each responder.
- Information from the onboarding form — such as call tree contacts, alert action preferences, and site details — is reviewed and confirmed directly with the customer.
- The documented escalation path and alert actions are shared with the customer for acknowledgment before being configured in the Eagle Eye system.
- Rules and alert actions (for email, SMS, or call notifications) are configured in accordance with customer requirements and internal emergency policies.

This stage ensures that verified alerts reach the right people, in the right order, without delay.

Stage 3 – Test Run and Law Enforcement Coordination

When the configuration is complete, a full end-to-end test run is conducted to validate system operation. This includes:

- Simulated firearm detection tests using safe replicas or controlled visuals to validate AI-Bridge performance, cloud verification, and Human Review Service (HRS) escalation.
- Real-time walkthroughs with the customer to observe the alert flow from detection through verification and notification.
- Incorporating customer feedback to refine camera alignment, field of view, and call tree timing.
- Planning coordination with local law enforcement or public safety agencies, as required. This includes identifying police liaison contacts, defining procedures for direct 911 notification, and aligning on-site actions with emergency response protocols.

By completing this stage, both the customer and response partners are fully aligned on how verified alerts are managed and escalated during real-world events.

Stage 4 – Training and Handover

The final stage involves customer training and transition to live operation.

- The implementation team provides a concise training session for site administrators, security staff, or facility managers covering:
- How alerts are displayed and managed within the Eagle Eye Cloud VMS.
- The process for updating or modifying contact information and escalation paths in the future.
- Use of optional tools such as Eagle Eye Emergency Camera Sharing, if enabled.

Following training, the system is formally handed over for live monitoring. Eagle Eye's 24/7 Human Review Service (HRS) continues to oversee alert verification, while the support team

remains available for technical assistance.

Setting Up Eagle Eye Gun Detection in the Cloud VMS

Follow the instructions in this section to set up Eagle Eye Gun Detection in the Cloud VMS.

1. From either Layouts or the Dashboard, select the camera you want to enable Eagle Eye Gun Detection on, then open its **Settings**.
2. Go to **Analytics > Gun Detection** and select **Bridge**. See Figure 5.

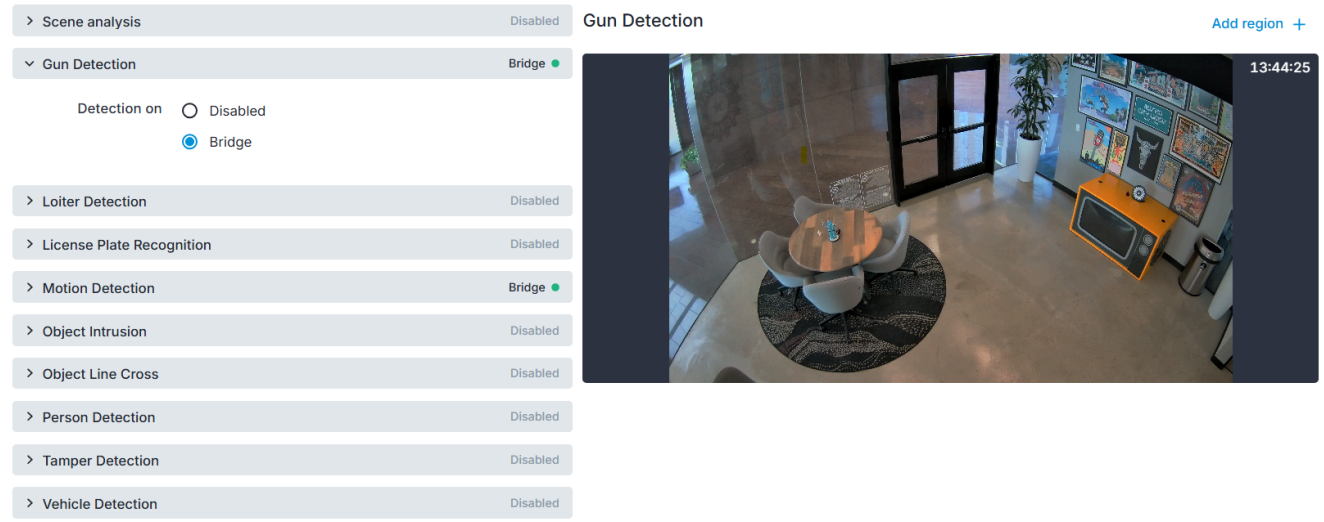


Figure 5: Enabling Eagle Eye Gun Detection

3. Click **Save Changes**.
4. To set up a Gun Detection Alert, go to **Automations > Rules**, and click the + icon to add a rule.
5. In the Add Rule dialog page, enter a rule **Name** (user-defined), set the **Alert Type** to **Gun Detection**, and select or add an action for **Gun Detection Notification**. See Figure 6.

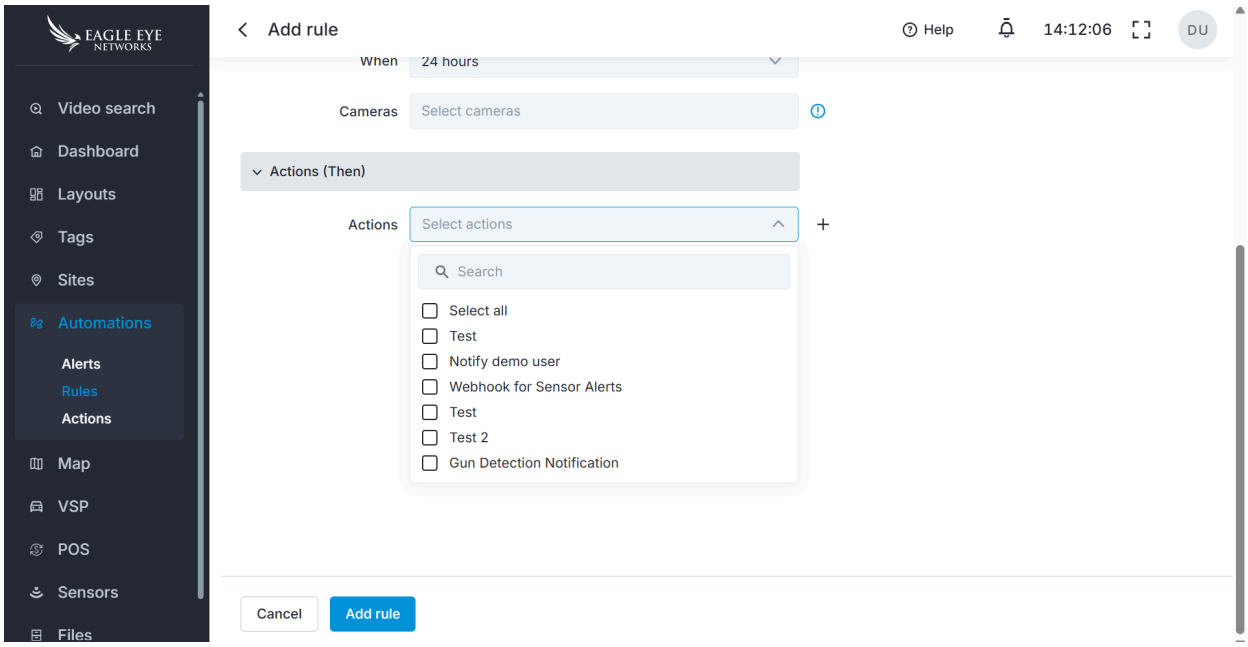


Figure 6: Setting up Gun Detection Notifications in the Cloud VMS

6. Click **Add Rule**.

Eagle Eye Gun Detection is now active for that camera on your system.

Enabling Eagle Eye Networks 911 Camera Sharing Service

Eagle Eye recommends enabling the 911 Camera Sharing service for all sites with Gun Detection. This optional cloud-based feature enables emergency communication centers to securely access live video from preselected cameras during an active 911 call, providing first responders with real-time visuals of the incident. For more details on 911 camera sharing, refer to https://www.een.com/911-camera-sharing/.

Key Highlights

- Customer Controlled: Only designated cameras are shareable.
- Emergency-Only Access: Live video is available only during an active 911 event, maintaining normal privacy.
- Secure and Audited: All access is encrypted and logged.
- Broad Compatibility: Works with most IP and analog cameras and is supported by over 99% of U.S. Emergency Communication Centers.

Recommendation:
Enabling 911 Camera Sharing for cameras with Gun Detection helps first responders assess the situation more quickly, visually confirm verified alerts, and make better-informed decisions

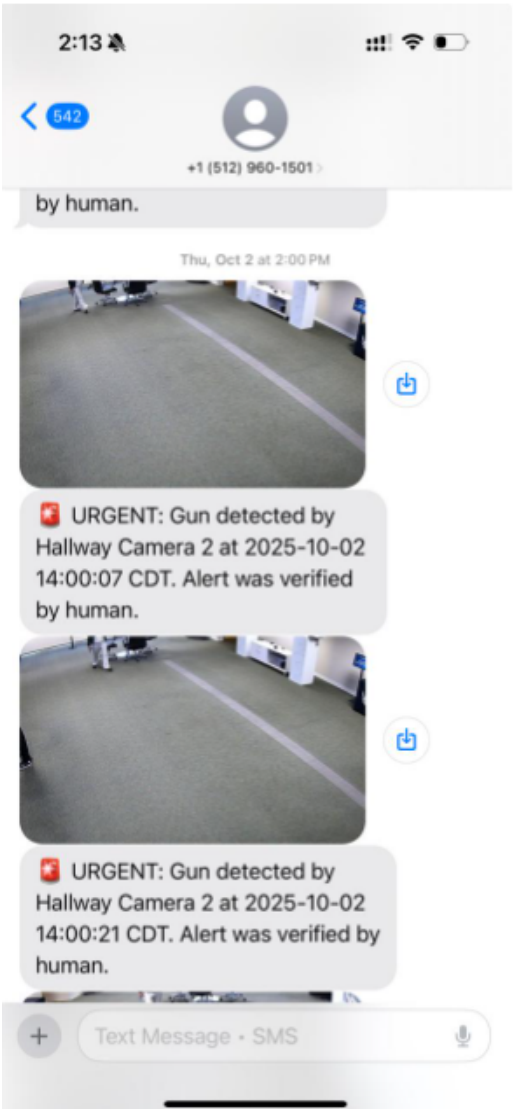
during critical moments. This integration strengthens the overall safety response by combining detection, verification, and real-time situational awareness.

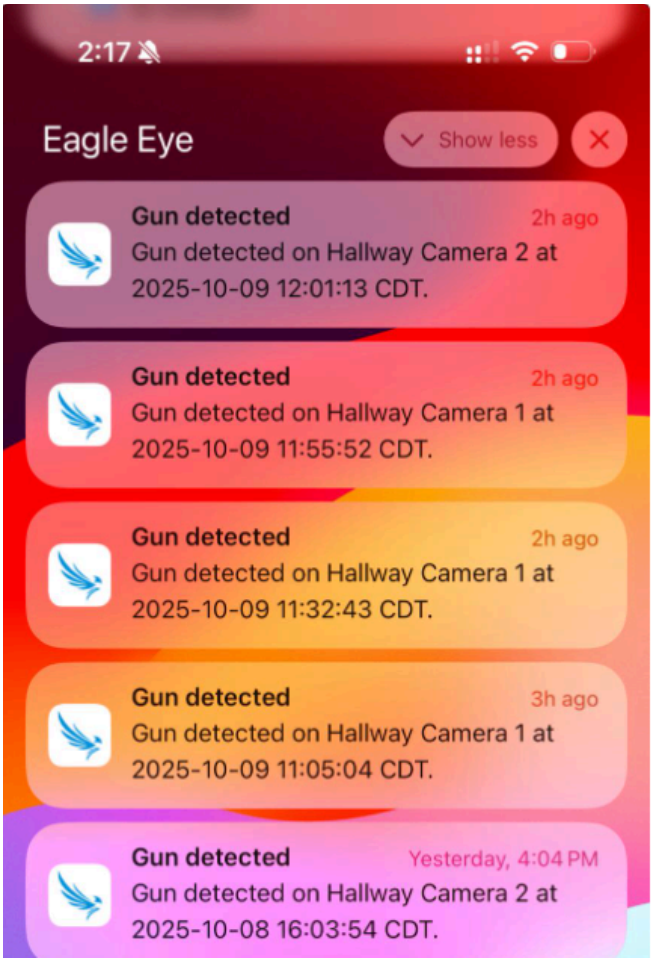
Gun Detection Notification Options

This section explains how a user is notified and what happens during an escalation.

Once a person with a gun is confirmed by the Human Review Service, the Eagle Eye Cloud VMS would initiate user notification as configured. Users could be notified via one of the following:

- MMS Text with reference to an image
- Push notification via the Eagle Eye Viewer mobile application
- Email notification





The Eagle Eye Cloud VMS can also take other actions, such as sounding an alarm in the security room or turning on a warning light.

In parallel to automated actions from the Eagle Eye Cloud VMS, the human review service operator would initiate the escalation path as defined by the customer.

These could include the following:

1. **Notify on-site security officers:** If the customer has a dedicated security team, they receive the first alert.
2. **Notify security administrators or staff:** This can include principals, superintendents, campus security directors, or facility managers.
3. **Direct call to 911:** HRS places a phone call to the local Public Safety Answering Point (PSAP).

System Limitations and Transparency

While Eagle Eye Gun Detection significantly enhances security, it is not a cure-all. It is designed to detect **firearms visibly brandished** and should be integrated as part of a broader, layered protection plan.

Detection Scope and Limitations

- The system detects guns that are clearly visible and held in hand; holstered or hidden weapons cannot be identified.
- Firearms blocked by large objects, crowd density, or poor lighting may go undetected.
- Disguised or color-blended weapons may reduce recognition accuracy.

Environmental and Technical Factors

Detection performance depends on proper camera placement, viewing angle, and lighting conditions. Poor visibility, glare, or insufficient illumination can affect accuracy. Cameras should meet recommended specifications for resolution and frame rate.

Minimizing False Positives

Objects resembling firearms—such as tools or replicas—may occasionally trigger alerts. However, Eagle Eye's multi-layered AI and human verification process significantly reduces false positives before escalation.

Human + AI Collaboration

Gun Detection should be viewed as a **force multiplier**, not a replacement for human vigilance. By providing early awareness of visible threats, it helps organizations act decisively, mitigate

severity, and strengthen overall preparedness when integrated with existing safety measures such as training, drills, and on-site response protocols.

Conclusion

Eagle Eye Gun Detection with AI cannot promise 100% accuracy, but it adds a critical layer of security. By combining edge AI, cloud AI, and human verification, the triple-layer system minimizes false positives while ensuring rapid, responsible escalation.

Early deployment at entrances and exits provides the greatest value, with expansion into parking areas and interiors as budgets and security strategies allow. When paired with strong processes, trained personnel, and layered security technologies, Eagle Eye Gun Detection can significantly reduce response times and help save lives.