



omnilert®

GUN DETECT WHITE PAPER

MCA

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A white, cylindrical security camera with a black lens and a black cable, mounted on a white bracket against a dark, textured wall. The camera is angled downwards and to the left.

INTRODUCTION

Omnilert Gun Detect is a comprehensive platform that combines innovative AI-powered, visual gun detection with the industry's leading emergency management solution. When coupled with an organization's own video surveillance system, the result is a complete end-to-end solution that encompasses detection, notification, engagement and management.

Built on an open architecture, Gun Detect seamlessly integrates with most security camera and video management systems, extending and enhancing these existing investments. Once connected, Gun Detect transforms surveillance equipment from a reactive, after-the-fact system historically used only to review situations post-event to a preventative solution, capable of proactively spotting and potentially preventing harm.

Unlike other solutions that merely identify weapons, Gun Detect is designed to recognize a firearm and the human movements and behavior consistent with gun violence. When both are present, Gun Detect instantly alerts security teams of a potential gun threat.

In addition to its gun detection capabilities, Gun Detect is also able to help manage the workflow of the incident, including multi-channel notifications, safety system integrations, automated management and intelligence gathering from those affected.

With Gun Detect, you get instant weapon detection, proactive threat identification and the confidence that your people, buildings and assets are protected.

GUN VIOLENCE: A SYSTEMIC AND COSTLY PROBLEM

A former employee is unhappy and believes he was unfairly dismissed.

His plan ... vindication, retribution ... to teach a lesson.

He parks, opens his trunk and walks towards the open facility door.

His every step is caught on video.

Unfortunately, this scenario isn't simply the plot of a sensational television show. It is the unfolding of events that have occurred at manufacturing plants, schools, stores and government facilities across the US:



- The Mueller plant in Albertville, AL, where two died in June 2021.
- Five killed, six injured at the Henry Pratt Co. in Aurora, IL, in the winter of 2019.
- A shooter in Bryan, TX, killed one and injured five others at the Kent Moore Cabinet facility.
- May 26, 2021, an employee of the Santa Clara Valley Transportation Authority used two automatic pistols to kill 10 of his co-workers.
- Twenty-three people killed and another 23 people injured in the deadliest shooting of the year at the Walmart in El Paso, TX, on August 3, 2019.
- A teenager entered Marjory Stoneman Douglas High School in Parkland, FL, on February 14, 2018, and killed 17 students and injured 17 others.
- The Virginia Beach Operations Building saw 13 dead and four injured at the hand of a co-worker on May 31, 2019.
- The Kroger Grocery Store in Collierville, TN on September 23, 2021, where two died and 12 are wounded.

In North America, there are more than 30,000 lives lost each year to gun violence. As of September 2021, this is already the deadliest year on record for mass shootings. According to the Gun Violence Archive (GVA), so far in North America, 531 incidents have left more than 32,000 individuals dead.¹ Although North America represents a remarkable statistic for the western world, gun violence is a severe issue in other locations like Latin America and South Africa, and a consistent problem across the globe.

While we measure the cost of gun violence primarily in the loss of lives, there are massive direct and indirect monetary costs. Everytown Research estimates a cost of over \$280 billion annually in North America, and that employers lose \$1.4 million every day in productivity, revenue and costs required to recruit and train replacements for victims of gun violence².

Nearly every month in 2021, an incident like those above was reported via the wire ... along with the list of the dead. While many of the facts change from scene to scene, one is often the same ... their every step was caught on video.

¹ Gun Violence Archive (2021, September 30) Schaeffer, K., (2021, September 13) Retrieved from <https://www.gunviolencearchive.org/>

²Everytown Research Org. (2021, February 17) *The Economic Cost of Gun Violence* Retrieved from <https://everytownresearch.org/report/the-economic-cost-of-gun-violence/>

According to reports, the US is a violent country.

It ranks 32nd in the world in terms of gun violence, and with nearly four deaths per 100,000 people, the US is eight times more deadly than Canada and almost 100 times more deadly than the UK.³

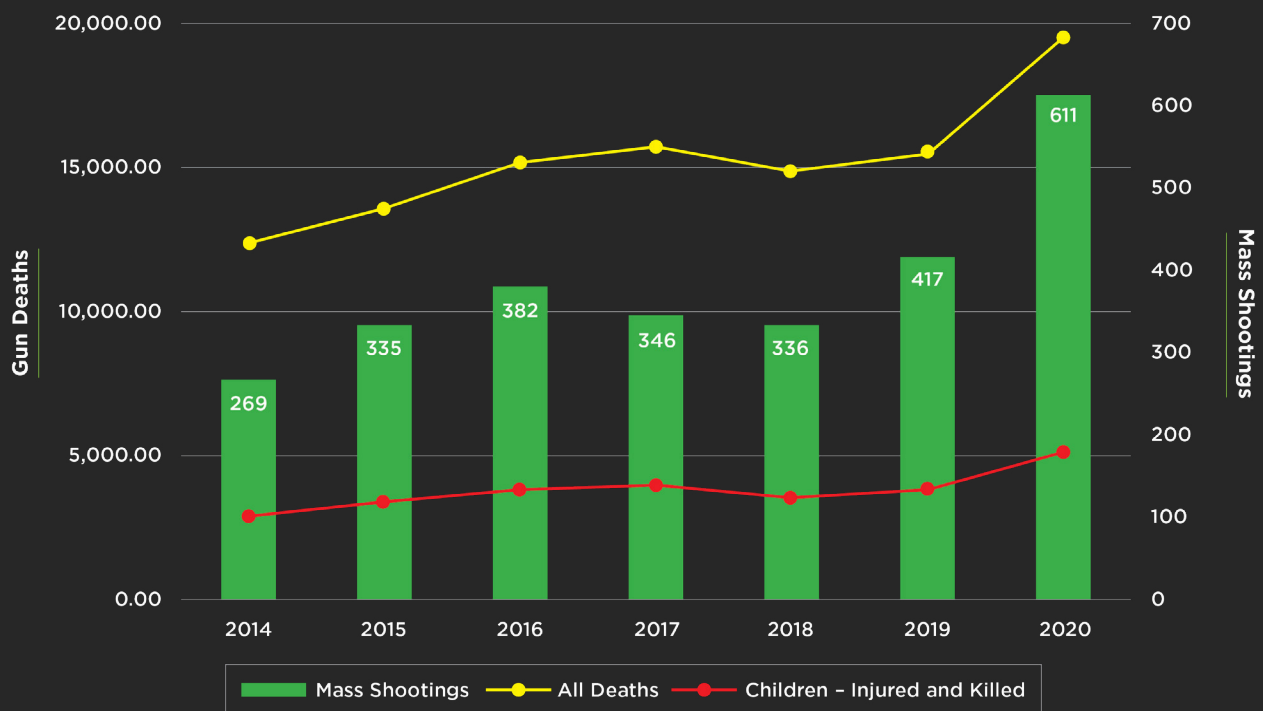
2021 isn't helping to lower these statistics. Per the FBI, gun ownership rose during the Pandemic, with a 20% increase in the number of federal background checks for gun purchases from March 2019 to March 2020.⁴

The worst part of these statistics is the increase in deaths attributable to guns, especially the deaths of children. Although 2021 isn't complete, its numbers already outpace previous years.

The chart below provides the details and clearly highlights the need for solutions to gun violence in America.

GUN VIOLENCE IN AMERICA

GUN VIOLENCE IN AMERICA | 2014 - 2020



Mass Shooting – an incident where a minimum of four victims shot, either injured or killed, not including any shooter who may also have been killed or injured in the incident

³Aizenman, N., (2021, March, 24) *Gun Violence Deaths: How The U.S. Compares With The Rest Of The World* NPR Retrieved from <https://www.npr.org/sections/goatsandsoda/2021/03/24/980838151/gun-violence-deaths-How-the-u-s-compares-to-the-rest-of-the-world>

⁴Schaeffer, K., (2021, September 13) *Key Facts About Americans and Guns* Pew Research Retrieved from <https://www.pewresearch.org/fact-tank/2021/09/13/key-facts-about-americans-and-guns/>

PUTTING VIDEO SURVEILLANCE TO WORK

Currently, there are nearly 70 million surveillance cameras installed in the US. That's just under one camera for every five Americans. That's a lot of cameras. That's a lot of surveillance.

Most of this surveillance investment comes from US businesses that install cameras to surround building perimeters, record activity in hallways and public spaces and flood security teams with hours of imagery. The problem is this flood. The volume of video recordings simply outnumbers the eyes that can watch. Active monitoring is expensive and often unreliable, with the result that video is normally consulted forensically to research an incident after it has occurred. Omnilert Gun Detect represents a way to tap into this passive surveillance and transform it into an active system that can positively impact the gun violence problem.



With the introduction of artificial intelligence (AI), those reams of video can be viewed, analyzed and acted upon quickly and reliably in real-time. Unlike human monitoring, AI scales to any number of cameras and is unwavering in its attention to detail. When a gun is detected, a series of events is immediately triggered, most notably the passing of critical data to security teams, alerting them to potential danger and prompting them to take preventative measures.

EARLY DETECTION IS THE DIFFERENCE BETWEEN LIFE AND DEATH

According to the FBI, most active shooter incidents are over within 5 minutes, often before police have time to arrive. Although every situation is different, many incidents involve a period of “staging” with guns removed from carriers and prepared, and periods of transition where the gunman moves towards his target area with guns visible. In an increasing number of buildings and public spaces, these areas are monitored by cameras, yet the unmanned nature of the surveillance means that these are missed opportunities for early detection.

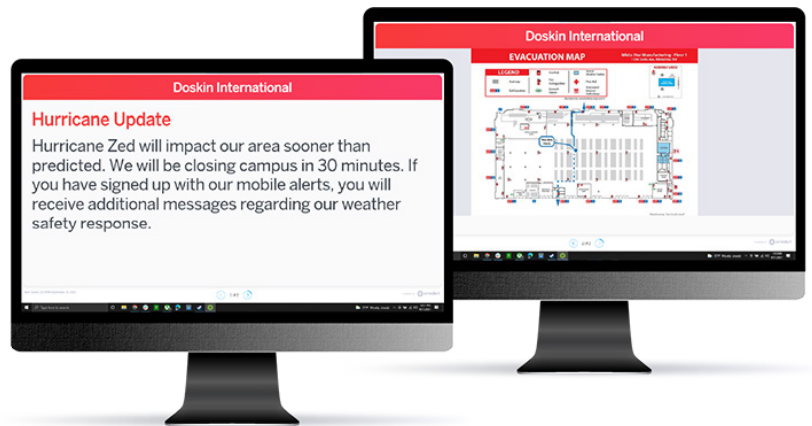
The addition of autonomous surveillance by Gun Detect allows for such early detection. A few seconds is enough to activate a cascade of activities:

- Alerting a monitoring team or service to validate the detection.
- Triggering of access control systems to lock doors, block entry or restrict access so that the movement of the perpetrator can be contained.
- Dispatching of a security or first responder team, armed with precise information to help improve their response and protect their own lives.
- Broadcasting an alarm to people in the area, including activating signage and sirens.
- Using the precision of the information to deliver detailed instructions to people, rather than a general lockdown notice.
- Notifying, automatically, an entire organization, by text, email, voice, social media channels, website update and push notification.

Gun Detect detects weapons within 1 or 2 seconds, assuming a reasonable level of visibility (see *product details*), while downstream services such as initial alerting and triggering external systems can complete within 3 to 10 seconds. This dramatically shortens the *time to respond*, while the information provided (location and video) in turn improves the *effectiveness of the response*.

Independent Action

Many organizations have some form of monitoring which includes panic buttons or similar systems which allow their people to trigger an alarm. Unfortunately, people may be unable to do this because of the immediate threat, such as a gunman holding up a convenience store. In this circumstance, an AI-equipped system can detect the presence of the weapon and raise the alarm independently. Gun Detect functions in this way to alert multiple members of an organization or to contact a separate monitoring organization.



Omnilert Desktop Alert

Critical Data

In many gun violence situations, security teams and first responders become aware of the incident through 911 calls from people witnessing the event or, more likely, reporting shots fired. The data provided about the incident is often inaccurate, incomplete and contradictory. Gunshots in particular can lead to compromised and confusing reports because of the difficulty in pinpointing where the sound originated. This flood of poor information leads to first responders dispatched with little or no concrete intelligence, reducing the timeliness of their response and dramatically raising the risk to everyone involved.

In contrast, Omnilert Gun Detect provides rich information relating to the incident:

- The location of each camera is known so that precise coordinates can be provided rather than vague or contradictory information.
- A picture of the detection, with the gun identified as a handgun or rifle and a full resolution image of the individual(s). Gun Detect can track any number of people and guns so that responders have an accurate description of their challenge.
- A video of the detection, comprising several seconds before the detection and several seconds after, to provide additional context and help determine the direction of travel.
- A continued follow-up of events to track movement from the same or other cameras.

Pre-Programmed Response

Gun Detect provides early warning and detailed information, and in a situation where every second can make the difference between life and death, the speed and accuracy of the response are critical. For this reason, Gun Detect harnesses the power of Omnilert's cloud-based platform to pre-program the many elements of an emergency response.

The Omnilert Platform allows an organization to plan for different types of situations in advance and then capture this plan in a series of steps — called a “Scenario” — which can be executed automatically. Scenarios capture an unlimited amount of steps: sending any number of different messages to different groups, through multiple channels. Scenarios also can make or set up voice calls, update websites and trigger external systems like access control, video management, signage and sirens.

This approach has several benefits:

- Helps an organization plan in advance, for multiple situations, so they can make use of their expertise and follow best practices when not under duress.
- Allows an organization to add and change their Scenarios as their needs evolve.

- Decouples the “what” of the emergency from the “how to respond” so that staff can be trained to identify the situation and execute the response without having to remember or understand the particulars of the response plan.
- Automates the response, initiated by a single command from a click on the Omnilert interface, an external trigger like a panic button or a connected system. Once triggered, the Scenario executes quickly and reliably, rather than requiring human execution at a time of potentially extreme duress.

Gun Detect combines with Scenarios to fulfill the promise of early warning.

THE STATE OF THE MARKET — OTHER MITIGATION STRATEGIES

Gun Detect is a visual, AI-driven solution to recognize and detect the presence of a gun and gun threat. There are, of course, other technologies on the market which also help mitigate the threat of gun violence. The most mainstream of these are gunshot detection and physical detection, both of which offer their individual strengths and weaknesses.

Gunshot Detection

Gunshot detection works by using microphones and algorithms to determine the location of gunfire through audible means. Microphones, spread throughout a defined area, are tuned to recognize gunshots and use the delay of sound to approximate the gunshot origination site.

The benefit of shot detection is its ability to provide intelligence to law enforcement and other security organizations, including the rough location of the incident as well as the number of shots fired. Often, gunshot detection systems are directly integrated with public safety access points (PSAPs) so that response time, as well as accuracy, can be improved. This audible approach can be employed to cover a substantial area, such as a downtown zone suffering from high levels of gun violence.

The most striking difference between Gun Detect and gunshot detection is its timing. While Gun Detect offers a preemptive defense, gunshot detection can only occur “after the fact” — once shots have already been fired. As such, gunshot detection is not preventative, but rather a “response improvement” technology.

THE REAL VALUE OF AI DETECTION

It is quick, it is highly accurate and its effort is continuous – all of which makes it extremely efficient and effective at monitoring video streams for threats of gun violence.

Artificial Intelligence, applied to the task of gun detection, is computer software programmed to recognize a firearm within a video stream. Fueled by a system of thousands of images, the software learns to recognize a gun in various positions and environments, such as a gun held in a hand or resting on a table, or a gun on a sunny day, as well as one inside a darkened hallway. As the system grows, so does the software’s ability to detect.

And while the accuracy and efficiency are impressive, the real value of AI comes in its quickness and the advance warning it provides when gun threats are detected. Within mere seconds, AI is able to detect a gun, alert security teams and carry out protocols that promote the safety of those vulnerable. Alarms can be triggered, emergency services called, doors locked and mass notifications delivered.

The Benefits of AI:

- Speed – Recognition occurs instantly
- Accuracy – Detection is near-flawless
- Efficiency – Monitoring is ubiquitous and constant

In the best of scenarios, the advance notice available through AI provides teams with the opportunity to stop those intent on harm.

Other differences are found with precision, cost and installation and maintenance difficulty. Given the inherent error in pinpointing a specific location from multiple microphones, a fault magnified due to reverberation in enclosed spaces, the audible approach can only approximate the location of the incident. And, with their requirement for sophisticated and proprietary hardware from multiple vendors, gunshot detection systems can be difficult and prohibitively expensive to deploy, install and maintain.

Physical Detection

Physical detection, otherwise known as concealed weapon detection, uses technologies that are capable of penetrating clothing and other forms of concealment such as baggage or even vehicles. These systems often use some form of acoustic or electromagnetic energy akin to radar, including micrometer and millimeter waves.

The advantage of these systems is that they are highly preventative since they can detect hidden weapons and constrain the movement of people carrying them. Unfortunately, the technologies used are most effective over a very short range so they are normally installed in corridors and entryways, such as the detectors we experience in airports, courthouses and some office buildings. They are expensive to install and require specialized training and constant staffing. Furthermore, the usage of these technologies can adversely affect the visitors to such spaces and so can be unattractive options for many use cases.

Visual Detection

Omnilert Gun Detect is a visual solution. The advantage of this approach is the combination of prevention with high performance, low cost, wide-area coverage, pinpoint location accuracy and minimal intrusiveness. The addition of the Omnilert EMNS platform allows for a fast and reliable response, including widespread communication and integration of additional systems.

The weakness of Gun Detect is reliance on the visibility of the weapon. If the gun is concealed, a visual solution has no way to detect it. Similarly, the effectiveness of the solution can be hampered by poor lighting conditions — darkness, mist/fog, long distances — or by the quality of the cameras in use. Despite this, Gun Detect is highly functional in many situations and can be particularly effective when combined with an existing surveillance system where it can add incalculable value to an existing investment when detection occurs.

Finally, a combination of these approaches — visual, audible and physical — can be employed to provide a “layered defense” system, if required.



OMNILERT GUN DETECT - PRODUCT DESCRIPTION

Gun Detect is a preventative safety system that monitors feeds from surveillance cameras and uses sophisticated artificial intelligence (AI) to detect guns and provide advance warning. Upon detection, Gun Detect can perform a variety of alerting and emergency management functions, including integrating with external safety systems.

The detection system is typically installed on-premise using a server equipped with a high-performance graphic processing unit (GPU). The on-premise approach allows for excellent responsiveness without the cost and complexity of transporting video across the internet.

Gun Detect is compatible with most surveillance cameras and video management systems. It can interface directly with IP cameras which are compliant with the ONVIF standard or which offer standard RTSP or HLS feeds. In addition, Gun Detect integrates with video management systems to support proprietary camera systems, as well as import camera metadata, annotate timelines, create events and raise alarms.

Through the use of AI, the system can monitor cameras much more effectively than humans, with unwavering attention on any number of cameras, 24 hours a day, 7 days a week. The AI uses a multi-step process to determine whether the weapon represents a threat, triggering detection only when a gun is brandished. Guns that are simply visible in the feed, such as those holstered, sitting on a table or displayed on the wall, are not considered threats and will not raise an alarm.

COMPETITIVE ADVANTAGES

Proven Company:

- 17-year industry innovator and veteran
- Trusted partner of thousands of US companies

Proactive, Preventative System:

- Seeks to preemptively detect gun threat
- Provides early warning of potential threat
- A proactive defense to stop gun violence

Cost:

As SaaS offering, delivers both economy and scalability vs. alternatives:

- Audible (Gunshot): Costly, hardware-intensive
- Barrier (Metal Detectors): Costly, requires expensive hardware and human monitoring
- Human Monitoring: Costly, requires security staff, limited reliability

Complete System:

- Native integration of gun detection software and EMNS system
- Allows for one single, seamless platform to both identify gun threat and activate emergency notification and management plan

Intelligent System:

- Based on real-life images, not merely images of solo guns
- Continuous improvement – updates daily as system receives new images from which to capture intelligence

Industry Leading Performance:

- Comprehensive detection of both guns and gun threats
- Sophisticated multi-step threat identification
- Accurate, with limited false-positives

Independent, Stand-Alone Design:

- Modular design allows independent, autonomous operation
- Purpose-built for private review of video stream

Gun Detect is a complete end-to-end system that focuses on shortening the time between detection and effective mitigation to best prevent loss of life. Gun Detect is, however, built as a modular system so as to meet a variety of requirements spanning detection through to emergency management.



Monitor

Gun Detect is set up to receive video feeds from camera systems.



Detect

Gun Detect discovers a gun in the video feed of a camera and, within just a few frames, can conclude that the gun represents a threat. An alert will not be triggered if a detected gun is not perceived as a threat (see Multi-Step Detection).



Priority Alert

Gun Detect is configured to send a high priority alert — the Priority Alert — to a group of people, typically staff members or the organization's security or response team. The Priority Alert is sent via text messaging or push notifications, as these are the fastest and most reliable ways to get attention. The Priority Alert contains rich information about the detection:

- A high-resolution image of the person(s) with the gun(s).
- A video, including 6 seconds both before and after the detection to provide context.
- The name of the camera (e.g. West Lobby).
- The precise location of the detecting camera, on an interactive map.
- A choice of Scenarios available for automated response execution.



The Priority Alert allows the recipient to validate the threat and choose the best response. Priority Alerts are also a methodology to allow external organizations to manage this important validation step, before taking action. An example of this capability includes the use of priority alerts by third-party monitoring centers, pushing notifications to client teams.



Automated Response

Pre-programmed Scenarios are shown as part of the Priority Alert and can be executed with a single click. Any number of Scenarios may be established, for example, “Lockdown,” “Dispatch Security,” “Contact PSAP” and “System Test” can all be included into a single alert (in any combination), allowing complete customization of the response. This setup decouples the identification of the threat from the decision of how to respond, easing the burden on the team and simplifying training.



Mass Notification

A Scenario can automatically execute notification to any number of individuals — staff, students, employees, citizens and guests — as well as communicate with police or first responders. Omnilert provides a multi-channel approach to notification, sending notifications by email, voice, text, push notifications to mobile and desktop applications, social channels and website updates. In addition, a Scenario can trigger external systems like access control, signs and sirens.

The notifications also leverage all information from Gun Detect. This means that the image, video and location are also transmitted to responders quickly and error-free. The precision of Gun Detect notifications is in stark contrast to the information normally available when relying on first-hand accounts from bystanders and random witnesses.



Mass Engagement

Omnilert allows for intelligent two-way communication with those impacted during an incident. Two-way communication offers the opportunity to both help people by relaying critical information and uncovering intelligence on an unfolding situation. Unfortunately, two-way communication can quickly become unwieldy and overwhelm a small response team trying to manage individual requests from a large number of people. Omnilert solves this problem by automatically grouping people based on their location and their response to questions sent to them including questions created in advance for this purpose.

Once segmented, each group can be communicated with independently and further subdivided to allow a large population to be dealt with in a manner that safeguards them best. For example, people within a specific group can receive personalized instructions guiding them to safety (e.g. “Move to the west”, “Leave via the North Elevator”), while another group can be sent other instructions (e.g. “Shelter in place”, “Help is on the way”).



Management

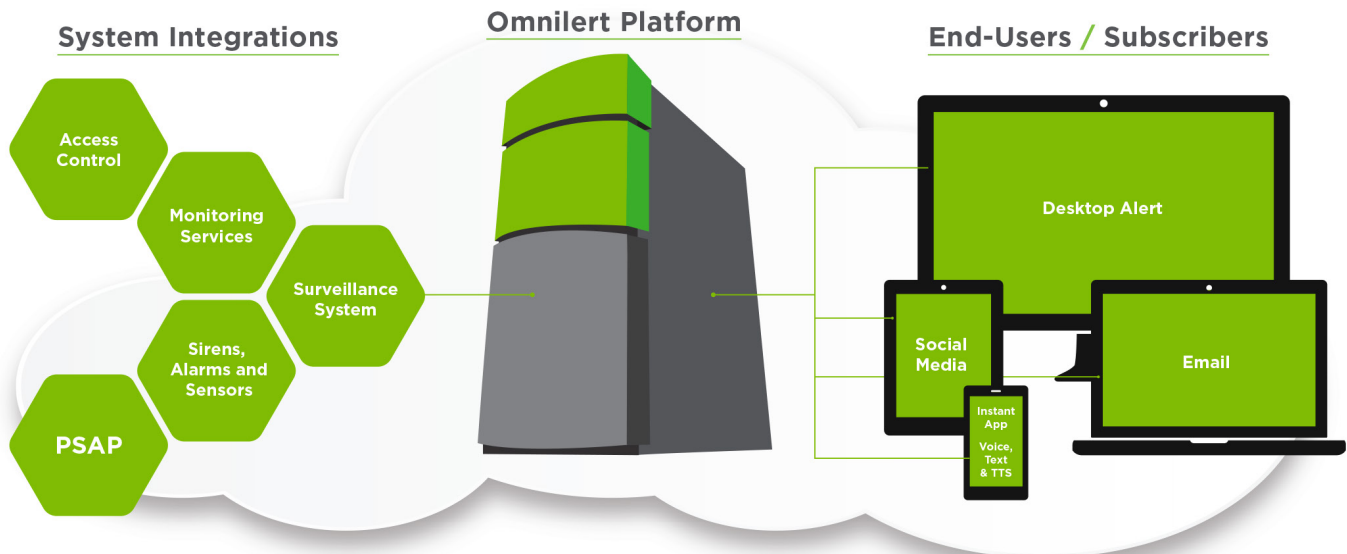
Omnilert provides a dashboard showing the location and grouping of people in different situations during the incident. The dashboard shows a color-coded map of people to allow the situation to be visualized easily, with totals of the number of people in each category. The dashboard is a real-time view, kept constantly up-to-date as people respond, making it easier to stay on top of a dynamic situation.



External Systems

Omnilert Gun Detect is an end-to-end platform composed of the Gun Detect AI software natively integrated with the Omnilert EMNS Platform. In any installation, of course, there are key external systems that also are required and form a vital part of the complete safety solution. Most useful are emergency mass notification systems, access control systems, video management systems and monitoring services.

Gun Detect provides a simple but powerful plug-in that allows for the integration of multiple services. Although Gun Detect normally includes its own emergency mass notification and management system (EMNS), its core detection functionality can be deployed standalone for integration with an alternative EMS.



The Gun Detect plug-in has two primary functions: camera integration and event triggering. Camera integration is used to retrieve camera information (name, location, etc) from a video management system during setup, while event triggering is used to trigger an external system upon a gun detection event.

The event trigger operates entirely on the on-premise Gun Detect server, executing an easy-to-create plugin responsible for the integration with the external system, typically through its API. Gun Detect makes all the detection information such as the image, video, camera name and location available to the plugin, allowing this data to be passed for complete identification.

Omnilter offers a range of complete and fully-supported plugins for market-leading systems and offers support and professional services for bespoke integrations.



Multi-Step Detection

Gun Detect employs a proprietary, multi-step process to determine whether a gun represents a threat or not. These multiple checks are included to provide a high-quality detection balanced with the requirement to maintain a low false-positive rate. The process involves detection of a human, recognition of a gun, and then, crucially, the identification across successive frames of video that the gun is being held and moved in a manner consistent with the gun being brandished. A detection event is only raised if each step of this process is identified.

This approach allows for many false-positives to be avoided, including:

- Law enforcement officers or security staff with holstered weapons
- Guns static in display cases or laying on shelves or tables
- Guns racked on moving vehicles

Gun Detect is trained via a proprietary dataset of real-life gun image and is a learning system, growing and becoming more accurate as additional customer systems are added. Both handguns and rifles are identified independently. And Gun Detect is able to detect a single person carrying multiple guns, as well as multiple people brandishing weapons, performing the detection process independently in individual tracks.

MANAGING FALSE-POSITIVES

Despite industry-leading performance, Gun Detect is not immune to false-positive detections. False-positives are erroneous detections where the object detected is not a gun, or where a gun is correctly recognized but mischaracterized as a threat. For this reason, the Priority Alerting mechanism puts a “human in the loop” as the final arbiter of threat response. Regardless, Gun Detect remains committed to its ability to pass minimal false-positives.

In practice, false-positives can often be eliminated through *training*, which is the process of successively passing images to the AI subsystem in order to allow it to learn what constitutes a valid detection in a customer’s environment. This can be particularly effective in situations where a hard, flat edge of a background can be learned and excluded from future detections, or where changes to the customer’s physical environment are frequent.

It is important to realize that Gun Detect is therefore a *learning system*. The AI model is continuously being trained by the Omnilert development team and constantly improved through the analysis of real-world detections occurring across the Omnilert customer base. This latter element is facilitated by the ability of the customer to flag a detection as a false-positive on the Priority Alert. This workflow instantly informs other members of the Priority Alert group that the incident can be dismissed as well as allowing the detection to be queued for the training process. During the training process, essential elements of the detection are extracted for input, but no private customer information is ever provided.

Gun Detect is designed to update its system automatically, during a configurable maintenance window. Although the entire system will be updated for new capabilities, most regular updates are to the AI model being constantly improved through internal and customer-derived learnings. Omnilert strives to update the model one or more times per month.

OPTIMIZING PERFORMANCE

Omnilert Gun Detect is designed to balance real detections with avoidance of false-positives. This can be a challenging balance, but in the end Gun Detect remains biased towards detection given the primary goal of preventing loss of life. With this in mind, the performance of Gun Detect can be influenced by several factors:

Visible Background

Many false-positives are avoided through the multi-step detection process. A false-positive, therefore, tends to occur in situations where people are holding and moving objects with hard, flat edges of similar dimensions to a handgun or rifle. Additionally, because of a lack of depth of field information, Gun Detect may confuse a hard edge which is part of the background as being something held by a person moving against it. These effects can often be mitigated by training or by adjusting the direction of the camera.

OMNILERT PROPRIETARY APPROACH

Accuracy in gun detection is paramount, and requires AI technology and complexities in terms of image discernment at distance. But merely detecting a gun is only part of what a comprehensive gun prevention platform should accomplish, and is what adds significant false-positives into the stream.

Given the sheer volume of guns in use in the US, most of which are carried lawfully, gun detection platforms must be able to distinguish between the presence of a gun and the presence of a gun threat.

Omnilert meets this criteria with its 3-step validation process and its reliance on proprietary AI technology, an ever-growing system of real-life weapon imagery, daily updates and custom integration with industry partners. It is these differences that put Omnilert in a class by itself.

Bandwidth

Video feeds can be constantly supplied to Gun Detect, or selectively upon motion or object detection by the camera or VMS. Selective detection can save substantial bandwidth, which can be important if video data is being transferred over the internet. Motion or object detection sensitivity should be balanced to allow for as much advance warning as possible.

Frame Rate

Gun Detect processes multiple frames as part of its multi-step detection process. Ten frames per second (fps) or better is desirable. Higher frame rates will allow for improved detection in situations where people may be moving quickly across the frame of the camera, especially if they are close to the camera with fast, angular speed. Lower frame rates can be used for cameras with a longer distance view or which are facing traffic patterns.



Resolution

Gun Detect prefers a minimum of *30 pixels per foot* to detect a gun, thus the capability to detect is a function of the distance from the camera and its field of view. Distant coverage will therefore require a higher resolution camera and/or tight field of view so that more pixels are available. Conversely, a regular field of view and short distances can be managed with lower resolutions. With wide variability of configurations, it is helpful to use a resolution calculator⁵ to achieve the best results. For the best system performance, use a resolution towards the minimum requirement for the use case, rather than incurring a heavier processing burden of high resolution across the network and on the Gun Detect server.

Compression and Other Artifacts

Gun Detect can support video feeds in h.264, h.265 and HLS formats. Many cameras employ a variety of compression techniques to save on bandwidth and processing, which can introduce artifacts — particularly motion-related — which can impact detection. In circumstances where testing shows that detections are compromised, especially in fast angular motion situations, the cameras can be adjusted to use different codecs or compression settings.

Lighting and Layout

Although Gun Detect works well in many lighting situations, a visual system obviously relies on visibility in order to detect, and detection improves with better lighting. Gun Detect will function well in dark situations when the area is correctly illuminated with infrared. Additionally, Gun Detect has been trained to detect from the typical perspective of a security camera, so performance is best when mounted above head height and angled down.

SYSTEM ARCHITECTURE

A Gun Detect installation will involve one or more Gun Detect servers installed on-premise, networked with a camera system and, potentially, additional safety systems such as access control, emergency notification and management systems.

The connection to the camera system is very adaptable, allowing for direct connection to local or distributed cameras, or indirect connection to the cameras via networked video recorders (NVRs) or video management systems (VMSs). NVRs and VMSs in turn could be locally installed on-premise, distributed or in the cloud. The tremendous flexibility of Gun Detect allows for many different types of architecture to be supported.

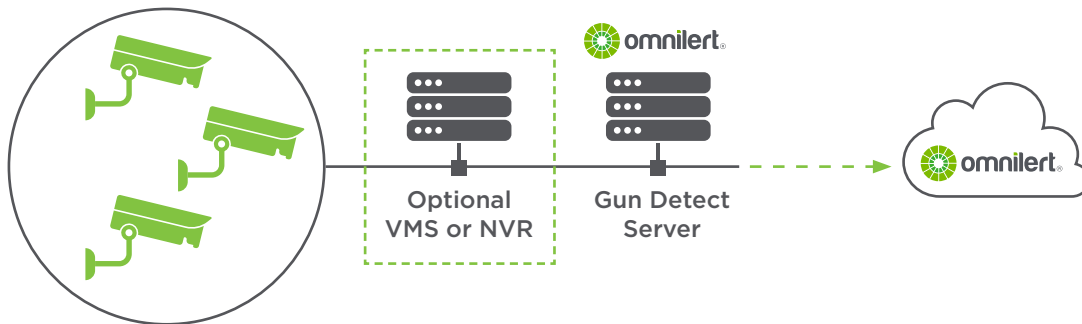
⁵IPVM hosts an excellent camera calculator at calculator.ipvm.com

In most circumstances the Gun Detect server requires a connection to the internet in order to retrieve training and system updates during its regular maintenance window and to access the rest of the Omnilert platform to perform downstream functions after detection (see Workflow). The section below gives examples of systems where such internet access may be restricted.

Example Architectures:

Single Network

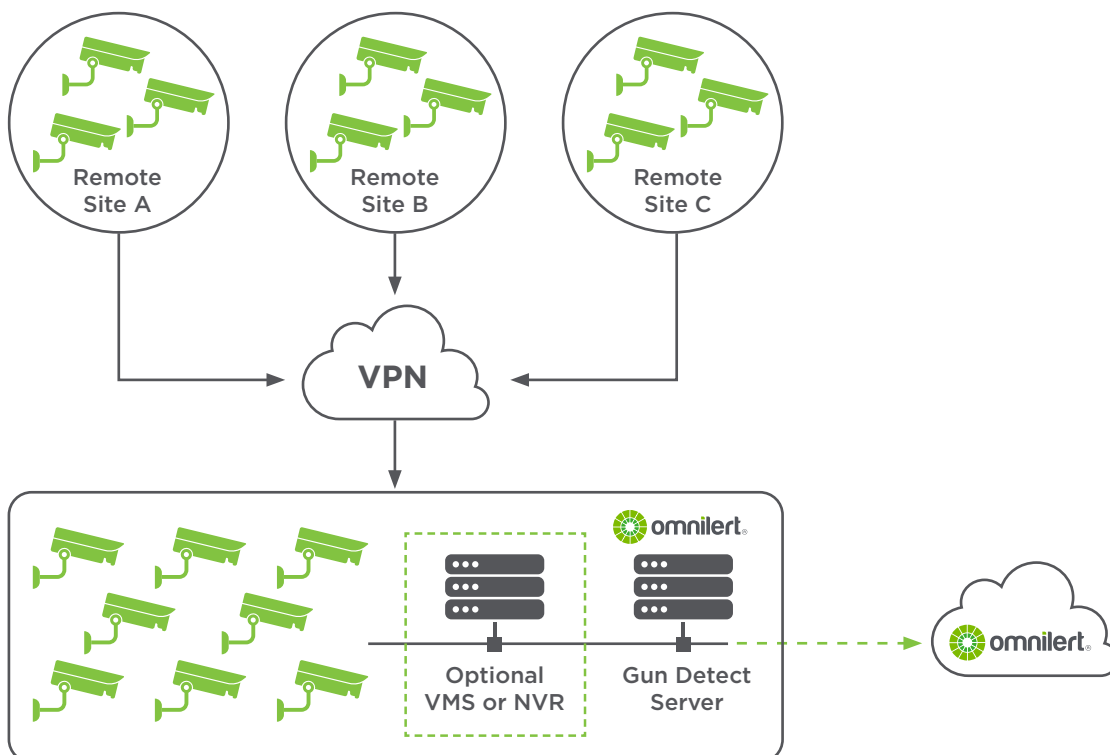
This is a common and simple architecture where the cameras, Omnilert Gun Detect server and NVR/VMS are in a single location. The Gun Detect system has internet access to support post-detection workflow if required.



Hub and Spoke

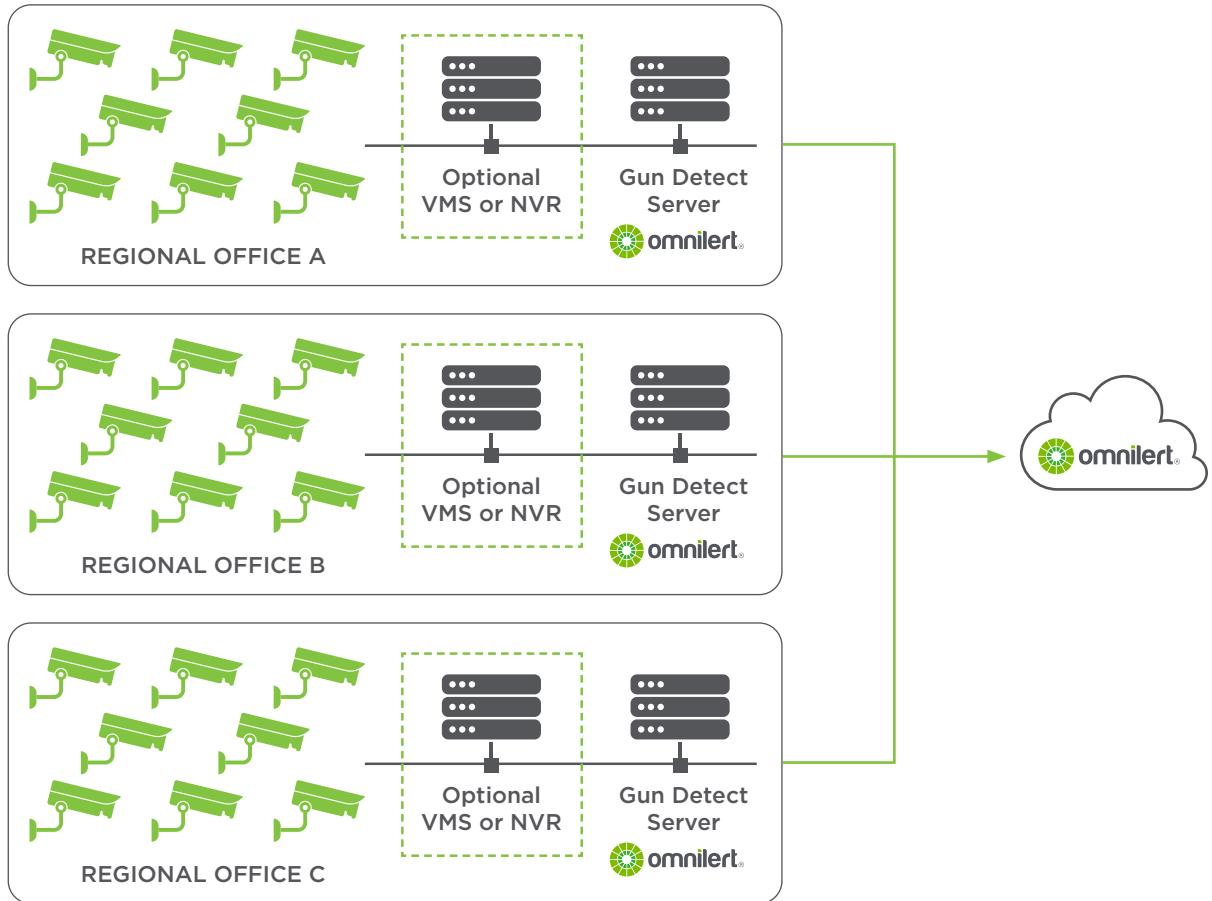
In this architecture, some cameras are local to the Gun Detect server while others are remote and connected over the internet. This allows for situations where there may be a regional center supporting several small remote sites. The regional center will contain the servers (Gun Detect and NVR/VMS) and use numerous cameras, while each remote site may only have a camera or two.

This approach can be an efficient way to place processing where it is needed most and limit the bandwidth required to push video across the internet.



Large Scale Distributed

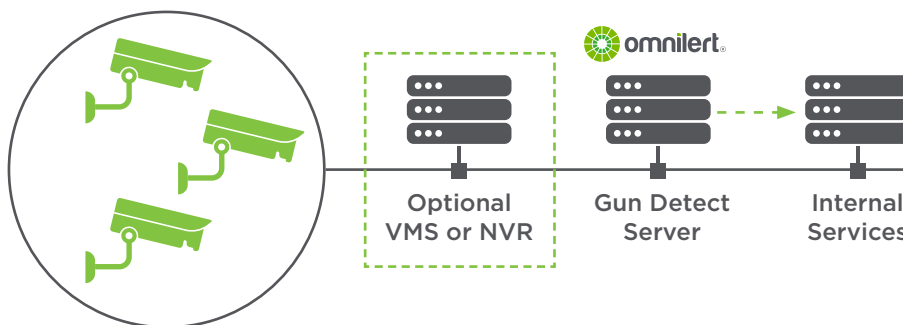
A large-scale installation would normally consist of several sites each with multiple cameras. In this architecture it may be prohibitive in terms of cost, performance and security to push significant amounts of video across the internet, so each location would be equipped with their own dedicated servers. In most situations, however, a single instance of Omnilert's cloud alerting would be used for post-detection workflow.



Private Systems

The post-detection workflow functionality of Gun Detect requires an internet connection in order to contact the Omnilert cloud-based platform and transmits data on detection events. For organizations who wish to keep all of their data within their own network, the Gun Detect “Core” package allows for complete internal, standalone use.

In this layout, no data will ever be transmitted externally, nor stored persistently by Gun Detect. Instead, Gun Detect plugins can be used to integrate with the customer's internal systems for post-detection workflow.



OMNILERT GUN DETECT PRODUCT PACKAGES

Omnilert Gun Detect is available in a variety of packages to meet different customer needs:

GD Base

The standard package is recommended for customers with an existing internal or commercial emergency notification and management system. GD Base offers a workflow from detection through Priority Alerting, allowing a customer to deploy Gun Detect and receive rich detection information on mobile or desktop devices for up to 10 staff members or designates. Mass alerting and management is completed through a customer’s own system, manually or through integration with Omnilert’s open Priority Alert APIs.

GD Notify

The basic package is recommended for customers who require a comprehensive, commercial notification system. Notify provides multi-channel communications to an unlimited number of end-users.

GD Engage

The Engage package goes beyond Notify to add critical two-way engagement, and allows grouping of people by location and their responses to polls and surveys.

GD Manage

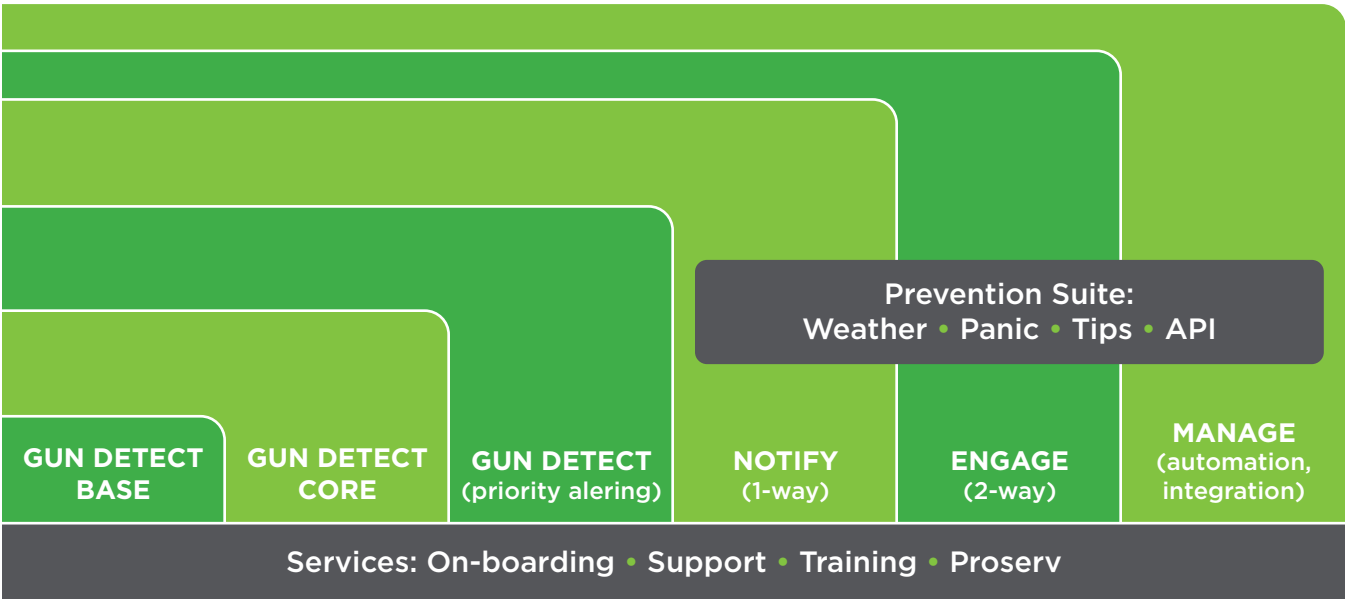
The Manage package includes all capabilities of Notify and Engage and adds the ability to trigger an automated, pre-planned response to incidents in the form of “Scenarios”.

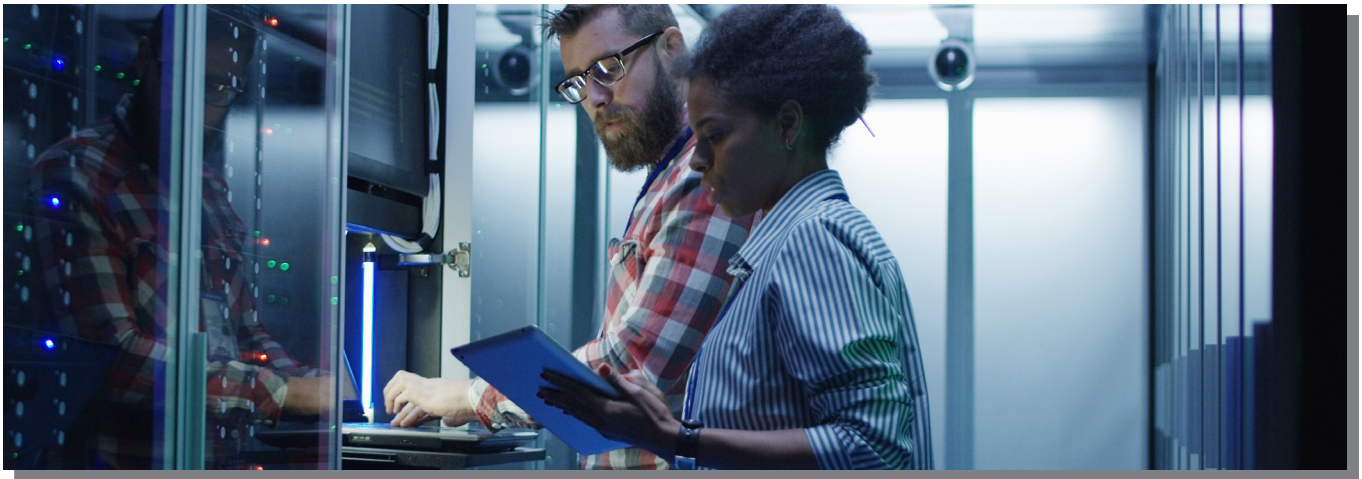
GD Core

GD Core is a “detection only” package for customers who wish to integrate Gun Detect with their own internal systems via the plugin mechanism. GD Core does not provide any post-detection functionality.

Optional Products

Omnilert has additional capabilities which can extend the functionality of Gun Detect. These include additional preventative systems, including Weather alerting, Panic buttons and Tipping, as well as subscriber applications for mobile devices and desktops.





SYSTEM REQUIREMENTS

Gun Detect runs on an on-premise server equipped with a powerful graphics processing unit for high-speed processing and optimal image quality. Details of system requirements are listed below and are based specifically on the number of cameras supported.

The GPU is the most critical component of the system as detection occurs there, and has a direct impact on the number of cameras supported.

We recommend a rack-mounted server with capacity for additional GPU systems and an appropriately large power supply. This will allow for more cameras to be added and support enhanced GPU technology as it becomes available.

A system will typically consist of:

Server

A rackmount server with a single CPU 3GHz (8-core or better), such as an Intel Xeon E-2278 CPU. Most processing is independent of the CPU.

Memory

16GB of memory or better. Larger camera populations may require additional system memory.

Storage

160GB SSD storage or better. Gun Detect does not archive video, so only limited storage is needed for the system and temporary storage of detection events.

Operating System

Ubuntu or Red Hat Enterprise Linux.

Connection

10GB network interface, or gigabit for smaller installations.

Graphical Processing

One or more enterprise-class nVidia GPUs, such as the RTX 4000 for small to midrange configurations or the RTX 8000 for larger systems. Cameras are primarily processed on the GPU and so the maximum camera support is often determined by on-GPU memory.



Founded in 2004, Omnilert pioneered the emergency mass notification market and is the innovation leader and trusted partner to thousands of institutions, including education, healthcare, manufacturing, private and public sector organizations.

Omnilert is privately held and headquartered outside of Washington, DC.

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