Active Shooter Scenario
Gunfire Alert and Detection Response

Conceptual foundations and performance requirements for mitigating indoor and outdoor active shooter threats to critical infrastructure and vulnerable targets

September 2014

Executive Summary

The 1999 Columbine mass tragedy provoked serious rethinking of the model that law enforcement used to respond both to that incident in particular and more generally to shooting rampages involving so-called “active shooters”. Recognition of the weaknesses so tragically highlighted at Columbine have in recent years led to the development and adoption of “active shooter” protocols throughout U.S. law enforcement which seek to confront the weakness of prior response philosophies.

We now have an extensive data base of mass shooting statistics from the past 30 years (over 100 incidents) that underscore the critical importance of prompt threat detection, initiation of internal protective measures and the rapid, integrated response of police, fire and medical units. All three factors are important components of a threat identification and management system. The most compelling finding from years of research is that minimizing the time between the detection of a threat and the initiation of internal protective measures, the activation of public safety responders and engagement of the threat is the prime determinant of lives saved or lost.

While law enforcement has adapted quickly in the aftermath of Columbine and developed improved tactics to confront “active shooters” rapidly, school systems within the United States have been slower to adapt. Although protective infrastructure (e.g., fire alarms, sprinklers, CCTV, communication nets, evacuation maps) is standard in many schools to deal with common emergencies, such as fire or hazardous materials that usually require evacuation, shooting threats—particularly in suburban communities—have been largely ignored until Newtown, Connecticut. Sadly, during the past 25 years, not one single death has been attributed to school fires in the United States (excluding dormitory fires), while during that same period more than 200 persons—many of them children and teenagers—have been killed in “active shooter” incidents over the same period. It is a national tragedy that mass shootings pose the greatest threat to American school children today.

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Background
Evolving Beyond Containment Strategies
Prior to Columbine, roughly between 1965 and 1999, law enforcement had developed and then refined a tactical philosophy which stressed prompt containment by patrol officers followed by subsequent activation of specialists—SWAT teams and hostage negotiators—to handle events of this nature. Within the framework permitted by that philosophy, patrol officers (the first wave of response) usually arrived on scene in minutes but lacked the equipment, teamwork, and training in advanced tactics to act swiftly and effectively during such high-risk incidents. Their immediate focus was thus scene containment. Conversely, though they had the equipment, teamwork, and advanced training to handle such incidents, specialized units often took up to an hour or more to respond and deploy at incident scenes. The framework exhibited a major weakness in the law enforcement response to what are now called “active shooter incidents”—a weakness which became all too tragically clear in the delay in entering and clearing Columbine High School.

Critical Findings of Active Shooter Research
• Most incidents have a total duration of 10 minutes or less
• The average time per injury/fatal shooting = 15 seconds
• 98% of mass shooting suspects act alone
• Shooters act with the intent to kill as many people possible in the quickest possible manner
• Shooters consciously choose settings where large groups assemble, particularly schools at all levels
• Most do not take hostages or attempt to negotiate
• Most suspects are suicidal
• Most suspects have planned the attack in advance
• Most suspects are familiar with the incident location
• Most are armed with high-capacity weapons that inflict traumatic and often fatal wounds very quickly

Motivating Challenges
1. Minutes matter—even the time to call 9-1-1 and explain the situation.
2. Local personnel do not have experience identifying gunfire sounds.
3. First responders need precise, accurate information when they arrive on scene.
Technology to Expedite/Support Internal Protective Measures

Early Detection

The research tells us that there is a substantial time continuum of possible threat detection, from the time that a shooter forms the intent to commit mass violence, to the time that he posts dark thoughts on social media or alerts friends, to the time that he acquires a firearm, to the time that he purchases ammunition on-line, to the time that he arrives at the site and enters, and, finally, to the final moment at which he actually starts shooting. Everything prior to the shooter’s arrival at the site can be classed as “early detection.” Early detection promises the opportunity to interdict an event before it happens. In counter-terrorist circles, early detection is the stuff of intelligence agencies and legal interception operations. Such techniques are of limited (if any) availability to traditional law enforcement in combatting active shooters. Early detection thus presents both tremendous benefits and tremendous—and historically insurmountable—challenges: how to detect the intent or planning of a single, lone individual acting within legal boundaries and with the full benefits of privacy rights and legal protections against illegal search.

Enhancing Tactical Response—Seconds Matter

Suppose early detection fails, as it did in Newtown? Suppose, for any number of reasons, that early detection of the threat turns out to be impossible. What measures can be taken in the earliest moments of an active shooter scenario which might mitigate the damage, lessen the shooter’s progress, or otherwise impede his ability to cause loss of life?

There is a crucial need to understand how changes in the law enforcement response model mesh with a school’s internal threat detection and management system. Improving the effective ratio of law enforcement-to-education cooperation necessarily involves developing both technology as well as protocols which minimize delays in threat detection, initiate internal protective measures, and rapidly activate police, fire, and medical first responders.

Gunshot Detection (Gunfire Alerting) Speeds Tactical Response

During an attack, critical time is lost as school personnel first seek to establish the nature of the attack—and, indeed, if there is an attack in the first place. Further, they may be unable to alert 9-1-1 or trigger internal alerts because they are fully engaged in protective actions or are themselves under attack. Moreover, 9-1-1 centers themselves necessarily require a several minute protocol to establish the veracity and precise nature of calls reporting possible attacks. Each of these steps (first establishing what is going on, second reaching 9-1-1, and third proceeding through the 9-1-1 phone protocol) takes critical seconds and minutes—time during which an active shooter can proceed (and historically has proceeded) with his attack.

As the research shows, there may only be a ten-minute window of opportunity to intervene decisively, contain an active shooter and minimize harm. When a substantial amount of this time is spent following the existing protocols, with no technological assistance or speed improvement, the results have been tragic.

Outdoor and Indoor Threat Vectors: Campus-Wide Gunfire Detection and Alert

The data show that attacks on critical infrastructure and schools often begin outside the building—somewhere within the broader campus area—and progress indoors. In Newtown,
the assailant famously “shot his way in” through a locked outside door and then proceeded with his attack. Thus the first line of defense lies outside the building, in a zone of protection surrounding it or comprising the entire outdoor area of a larger campus of many buildings.

**Outdoors: Wide Area Acoustic Surveillance (WAAS)**

Outdoor areas require wide area acoustic surveillance. While this whitepaper focuses primarily on analyzing the benefits of indoor detection, it should be stressed that SST pioneered the concept and implementation of wide area acoustic surveillance (WAAS) for gunfire and other kinetic events, and its ShotSpotter® gunfire alert and analysis solutions are deployed in 70 cities nationwide and in many countries around the world. The usual scope of such urban deployments (many square miles) greatly exceeds those of a typical campus environment (several to tens of acres), so for the avoidance of confusion, we limit our discussion in this whitepaper to the geographic footprint of the campus. Nonetheless, within the campus, the ability to detect so-called “breaching attacks” is critical, particularly as they may offer the best opportunity to alert those inside buildings to an impending attack.

**Indoors: Gunfire Detection and Alert System (GDAS)**

An indoor gunfire detection and alert system (GDAS), integrated into a comprehensive school-police-fi e-medical response system, increases significantly the likelihood that active shooter threats will be identified quickly and that alerts will be triggered automatically and far more quickly than would an event reported manually by school personnel. As an integral component of such a system, the technology would promptly notify public safety responders about the nature and location of the incident within the building. It would also make internal notified to ensure that protective measures are taken throughout the school. Two different scenarios, one without and one with GDAS technology are provided in Appendix A. The second one, in which GDAS is an integral component of a school’s threat detection and response management system, demonstrates the lifesaving potential of rapid, reliable gunshot detection which automatically triggers “active shooter” protocols by school staff and public safety responders.

**Performance Requirements**

The technology must meet a number of key performance requirements:

- **It must be reliable.** That is, it must provide accurate and timely information regarding gunfire occurring in a campus environment. Reliability has two dimensions: One is an
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extremely low rate of false positives (reporting events as gunshots which are not in fact gunshots); the other is a near-zero rate of false-negatives (all gunshots are detected and reported). The technology also must provide coverage of an entire campus that includes several different types of spaces (see section 4 for further description of these types).

- Must provide meaningful intelligence to expedite and guide the response to the threat by school staff and public safety responders real-time. By reducing uncertainty—the number of unknowns—GDAS can provide internal and external responders with clarity regarding a gunshot threat. As a result, rather than delaying action while they attempt to make sense of a confusing situation (like the principal in the first scenario), internal staff can immediately initiate protective actions, knowing that the system is triggering internal and 9-1-1 alerts. Precious minutes are saved. The system, especially if technology components interact, can also provide police responders with updated information with which to track a shooter’s movements.

- Must disseminate tactical intelligence to first responders during the “ten-minute window of harm” documented in the literature is critical. Most campuses, particularly at educational institutions below high school, do not have dedicated law enforcement officers. Responding officers will probably have limited knowledge about the school’s layout and traffic circulation. Thus, the most valuable intelligence needed by first responders is a detailed map of the campus with a chronological mapping of gunshot alerts. Again, GDAS can expedite the police response, increase the chances of swift threat interdiction and conserve precious minutes.

- Must compress the detection-alert-response cycle to contain and neutralize active school shooter threats rapidly. Shaving time—minutes, even seconds—from each stage in that cycle can be life-saving. In this regard, the most important referent is the “ten-minute window” of intervention mentioned above.

- Must provide redundancy to compensate for the fact that on-site staff may not be able to initiate important actions, including internal and 9-1-1 alerts.

- Must be integrated into a comprehensive threat detection-response management system that integrates technology, written response protocols, and user training, both initial and refresher (including discussions, case studies, table talks, scenario-based talk- and walk-throughs, hands-on exercises).

GDAS As a Decision Support Tool
GDAS and the system in which it is embedded should provide both internal and external responders a steady stream of information to support incident decision-making. The system should support several types of decisions and resultant actions: automated alerts and triggers; protocol-based actions and command and control courses of action. The following listing provides examples of each type.

- Confirm active threat (AT)
- Alert school staff to initiate lockdown protocols (AT)
- Trigger the establishment of a school command center (a designated site with communications and CCTV if safe) (SOP)
- Notify public safety responders and provide initial intelligence (number of gunshots, location) (AT)
- Provide site graphics to police responders (AT)
- Activate “eavesdropping” capabilities (AT)
- Provide timely updates to site command center and public safety responders (AT)
- Orient CCTV to incident location and provide feeds to site command center and public safety responders (AT)
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- Assign Fire and EMS responders to staging or site response, depending upon threat status (C&C)
- Establish an assembly point for responding parents and a media staging area (C&C)
- Establish communication between site staff and police responders (SOP)
- Coordinate tactical response to locate, contain and eliminate threat(s) (C&C)
- Coordinate the response to casualties once the threat has been contained or eliminated (C&C)

AT = Automated Technology
SOP = Standard Operating Procedure
C&C = Command & Control

Collectively, this list addresses the core concern of Challenge #1 (“Minutes matter—even the time to call 9-1-1 and explain the situation”).

Requirements
Various Responder User Groups

An effective gunfire alert system is designed to expedite protective actions, speed tactical response, and eliminate threats quickly. Therefore, it must take into account the needs of individual responder groups which will become involved in the chain of events triggered by GDAS. Some needs are unique to a particular user group, but most are common to all user groups.

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<th>End User</th>
<th>Reliability</th>
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<th>Mutuality</th>
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Tripwire: A means of detecting a threat and triggering relevant alerts and response protocols.

Reliability: The extent to which the system detects actual gunshots and, conversely, has an extremely low rate of false positives.

Timeliness: Information from the system is relayed immediately and automatically.

Mutuality: The extent to which all user groups understand critical interdependencies, their respective roles and adhere to agreed-upon protocols.

Decision Support: The extent to which the system provides significant information to key decision-makers in real time.

Providing Tripwire, Reliability, Timeliness, Mutuality, and Decision Support jointly address both Challenge #1 and Challenge #3 (“First responders need precise, accurate information when they arrive on scene”).

Diverse Campus Environments

While all campus settings are unique, all are composed of similar structural components that may require varying types of gunshot detection technology (GDAS) to provide adequate system coverage. The following types of structural components must be considered when developing a campus-wide GST solution:

Standard Enclosed Room

Rooms used for classroom instruction, office space, or small meetings. These rooms typically range in size from 500’ to 1000’ sq. feet. These spaces likely accommodate 5-50 people when in use.

Multi-Purpose Enclosed Space

Rooms used to accommodate larger amounts of people such as malls, gymnasiums, auditoriums, cafeterias, libraries, and theaters. Typical high school gymnasiums measure 100’ x 60’ and can accommodate up to 1500 people.

Indoor Transit Routes

Hallways, corridors, and stairwells that permit foot traffic in an indoor environment.

Outdoor Transit Routes

Areas designed to facilitate foot traffic in an outdoor environment.

Outdoor Multi-Purpose Space

Outdoor areas designed for the congregation of people such as courtyards, athletic fields, lawn areas, and parking lots.

Site Survey Requirements

Is required to determine the most effective deployment of GDAS. The survey team should minimally consist of the following personnel:

- Campus Police of Security Representative
- Local Law Enforcement Representative
- Campus Administration Representative
- SST Public Safety Advisor
- SST Technology / Project Management Representative
Detection and Incident Evaluation

Incoming detections should be vetted through the SST monitoring center. Incident analysis should be conducted using as many evaluation parameters as possible:

- “Normal” Acoustic (Audio) signal
- Muzzle flash (I/R) detection
- Other acoustic sensing methodologies (e.g. attenuated audio signals)
- Post-incident reaction noise (What are the audible reactions to persons inside the room?) (note: such data will necessarily require short time recording windows in order to ensure privacy as well to limit required transmission bandwidth)

Sharing Unique Experience: SST Incident Review Center

One of the most intractable problems in developing responses to active shooter scenarios is the sure knowledge that most of the people on any given campus likely will not recognize the sound of gunfire when it first happens. Especially when surrounded by building walls which attenuate sound, inexperienced civilians simply do not have the practical, real-world experience with firearm discharges to make an immediate, experienced assessment of the threat.

Since 2011, SST, Inc. has operated a 24x7x365 Incident Review Center at its national headquarters in Newark, CA. This facility, with redundant connections to some 60+ systems nationwide, has as its sole aim monitoring gunfire acoustic events across the nation—and, indeed, now in several countries and on several continents. We believe IRC personnel will constitute the critical missing link in addressing Challenge #2 (“Local personnel do not have experience identifying gunfire sounds”).

The SST IRC reviews hundreds of thousands of incidents per year. In the first six months of 2013, the center reviewed well over 250,000 incidents, of which approximately 19,000 were found to be gunfire. Each individual reviewer listens to several thousand incidents and undergoes hundreds of hours of training before handling his or her first live incident.

The infrastructure thus exists to process incidents in a real-time manner, collecting data from sensors deployed worldwide, and deliver critical information to first responders in seconds.
Situational Awareness for First Responders

As part First responders can quickly determine if the suspect(s) are mobile and adjust their tactical response based upon live information. This Situational Awareness directly addresses Challenge #3.

Notification of Campus Personnel

All campuses are required to have safety plans in place that dictate actions to be taken during critical incidents. Lockdown procedures are common, however, communication during lockdown events is poor and often nonexistent.

An integrated SMS or similar type feed to campus personnel during critical incidents could also provide valuable intelligence to first responders:

- Indication lockdown has been initiated and personnel/students are not harmed
- Number of personnel/ students present
- Instructions, questions, or updates
- Evacuation instructions

The same mapping system can utilize smartphone GPS to indicate the location of subscribed personnel and their status during critical incidents.

Campus Map with Integrated GPS Status Reporting
Active Shooter Scenario

Gunfire Alert and Detection Response

Real-time mobile device integration affords the ability for first responders to quickly visualize the location of onsite staff to include in relation to detected gunfire.

System Architecture

Existing 24x7x365 Operations

SST operates a world-wide network of several thousand (outdoor) ShotSpotter wide area acoustic surveillance sensors on a 24x7x365 basis. We are contractually committed to remaining high availability and to design redundant sensor networks which are capable of continued performance when one or more sensors is damaged by e.g. lightning or vandalism.

The proposed approach leverages this existing infrastructure at several levels:

- Existing 24x7x365 world-class data center, with triply redundant high-bandwidth (1Gbps+) Internet connectivity, doubly redundant power and environmental controls, and biometric and physical security systems.
- Existing operational sensor network already deployed in cities nationwide, with on-the-ground experience securing permissions for, installing, and maintaining sensor networks in often hundreds of physical locations in a given city.
- And end-to-end data architecture for capturing, recording, evaluating, and notifying end-user first responders of critical, time-sensitive incident alerts.
- Experience integrating these alerts into PSIM, CAD, video surveillance, and many other on-site physical security platforms while still maintaining a world-class cloud-based back-end infrastructure.

Outdoor Sensors: Outdoor Sensing and Optional Connectivity/Backhaul

A small number of sensors (minimally 3, but perhaps as many as 6-8 for a larger campus) will be deployed on the roof(s) of the building(s) to be protected. These ShotSpotter sensors are typically used by SST for covering large urban areas and are weather- and security-hardened to survive many years in rough outdoor conditions. They are remotely monitorable and configurable, and critically off the ability to act as analyzers of the data stream from indoor sensors. They also can optionally aggregate and backhaul data for these same indoor sensors. (Note: such functionality is not per se required; should an existing technology or network provide backhaul and connectivity, the role of these sensors will merely be to analyze the data stream and transmit along the existing pathways.)

Indoor Sensors: Minimal Cost, Maximum Ubiquity

The design goal for SST’s forthcoming indoor gunfire alert sensor will be low cost and high fidelity. They will be designed to be sufficiently inexpensive to permit deployment in each room within a building without sacrificing their ability to detect and trigger on gunfire.

Sensing Modalities

SST maintains one of the largest libraries of the acoustic signatures of gunfire in the world. That experience and those data have permitted us to choose three sensing modalities for our first generation indoor sensor:

1. Direct acoustic (unfiltered, no attenuation)
2. Heat (infrared)
3. Attenuated acoustic (heavily filtered, proprietary approach).
The combination of these modalities produces a characteristic sequence of triggers within the sensor, and it is this characteristic sequence which permits aggressive filtering of false alarms. (For example, while a loud “bang” may sound like a gun, it will not carry with it the heat signature of a muzzle blast.)

**Short-Time Sound Recording (Approx. 4 Seconds)**
To balance privacy concerns with the ability to disambiguate false alarms from actual alerts, the sensor carries sufficient memory or record a very short period of time (presently, approximately 4 seconds). This period is sufficient for IRC personnel to make an assessment of the nature of the incident (gunfire, fully automatic gunfire, other loud noise, etc.) but does not provide enough time to meaningfully invade the privacy of those in the sensor’s vicinity.

**Redundant, Self-Configuring Radio Connectivity (“Mesh”)**
The sensors each carry a small digital radio module which operates in a similar frequency band to WiFi or Bluetooth, but uses a proprietary, lightweight mesh communication protocol which provides sufficient bandwidth to transmit both telemetry signals and incident notifications. These signals are be captured by aggregator nodes, themselves connected to the outdoor sensors located on the roof.

**Delegated Processing**
The outdoor sensors are, in fact, the devices which identify and notify SST’s ShotSpotter cloud server software of a gunfire incident. SST pioneered the distributed, collaborative approach to gunshot detection in which one or more sensors can contribute to a single (coordinated) gunfire incident location nearly a decade ago, and the intent of this project is to leverage the stability of our distributed collaboration platform to permit indoor gunfire data to be integrated into our end-to-end environment directly alongside existing outdoor data streams.

**Architecture Schematic**
Complimentary Technologies

A number of associated and related technologies can be integrated to provide a 360-degree solution for end users. The following is intended as an indicative list of such technologies and not an exhaustive list:

- **Sensing/Network**
  - Security and alarm networks
  - Existing technology networks (e.g., WiFi)
- **Video**
  - Video Surveillance
  - Video Management Systems (VMS)
- **Infrastructure**
  - Physical Security Information Management (PSIM)
  - Site security and building management technologies
  - Physical security measures (bollards, locks, shields)
- **Organizational**
  - Computer-Aided Dispatch (CAD)
  - Common Operating Picture (COP) systems
- **Alerting**
  - First responder notification and alerting technologies
  - SMS and other campus-wide electronic broadcast techniques
  - Public Address (PA) and other alerts sirens

Summary

Revisiting the Three Challenges

At the beginning of this whitepaper, we presented three motivating challenges which drove the rest of our development. We repeat them here, highlighting the mechanism by which whitepaper addresses each challenge:

1. Minutes matter—even the time to call 9-1-1 and explain the situation
   A GDAS removes minutes from response by providing persistent surveillance for triggering, explosive acoustic events, automatically reporting them to a 24x7x365 infrastructure already built for real-time response to gunfire, and then automating the process of notifying first responders.

2. Local personnel do not have experience identifying gunfire sounds
   SST's Incident Review Center personnel are uniquely experienced in evaluating gunfire hundreds of thousands of incidents per year, evaluating their relative threat level, and providing first responders with information in a timely and accurate manner. By leveraging the existing decade-long work on communications infrastructure and protocols, the GDAS eliminates the need to build a parallel capability—or, worse yet, go without experts at a critical moment.

3. First responders need precise, accurate information when they arrive on scene.
   When first responders arrive, the quality of the information provided by the GDAS is unmatched: number of rounds, sequence of rooms in which events occurred, and other data will be presented to the first officers on the scene. In combination with Law Enforcement's new framework for responding to active shooters, such situational awareness is critical to responding swiftly and with maximum precision.
Appendix A

Scenario #1: Without a GDAS System

Shooter, now a high school dropout, harbors a deep sense of injustice that he was treated unfairly by teachers and other students at Vision H.S., a large regional campus with 1500 students in a community of 50,000. Over a period of months he has posted a series of “dark”, cryptic messages that allude to a future state when “balance will be restored”. He hangs out at a local skateboard park with several other dropouts. He has access to his father’s hunting rifles, which include a semi-automatic version of the M-16. He interacts little with his parents, who are away for extended periods as a result of their jobs.

After months of planning, the shooter drives to Vision H.S. with a variety of firearms and a large supply of ammunition. It is mid-morning and all students are in classrooms or the gymnasium. He enters through a back door of the gym and immediately confronts the lead gym instructor, whom he shoots without hesitation. He then starts shooting at close to 100 students in the gym; several are hit and the rest scatter, most escaping through the main entrance. The shooter follows at a measured pace, firing random shots as he moves.

The school principal is in the process of making rounds to check on several new teachers. Upon hearing the sound of a possible gunshot in the gym, he moves quickly to the gym to determine what is going on. He immediately sees a wave of frantic students running out the main entrance. He continues to the door of the gym where he confronts the shooter, who immediately shoots him fatally. The shooter walks a short distance and tries the door of a classroom. It is unlocked, so he enters and finds 30 students and teacher looking out the windows to see what is going on in the gym. He starts shooting and a number of students are hit. He exits the classroom and continues on to another classroom, but finds the door locked. He continues moving through the school checking classroom doors.

A passing police officer sees dozens of students running from the campus. He has received no dispatches about an incident, so he drives immediately onto the campus and stops in the turnaround just outside the principal’s office. Simultaneously, the shooter steps out of the shadows and shoots the officer multiple times. He then continues to hunt additional victims.

Eventually, a teacher who looked out and saw the shooter, then locked his classroom door and shut off the lights, calls 9-1-1 and reports the shooting. Several minutes later, police, fire and medical units arrive and start performing their respective duties. However, they have no idea where the shooter is. They come under immediate fire, forcing them to abandon downed students and seek cover. Finally, an officer with a long gun spots the shooter and fires one shot that ends the rampage. A total of 11 minutes have elapsed from the time that the shooter fired the first shot until he was fatally shot. Witnesses estimate that the shooter remained in the gym for approximately four minutes, then exited by the front door and entered an unlocked classroom. There are 2 fatalities in the gym, 7 in the unlocked classroom and 10 other in a hallway. The principal is also a fatality, along with the teacher in the unlocked classroom. Numerous other students are suffering from nonfatal gunshots.

Scenario #2: GDAS System

Shooter, now a high school dropout, harbors a deep sense of injustice that he was treated unfairly by teachers and other students at Vision H.S., a large regional campus with 1500 students in a community of 50,000. Over a period of months he has posted a series of “dark”, cryptic messages that allude to a future state when “balance will be restored”. He hangs out at a local skateboard park with several other dropouts. He has access to his father’s hunting rifles, which include a semi-automatic version of the M-16. He interacts little with his parents, who are away for extended periods as a result of their jobs.
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Gunfire Alert and Detection Response

After months of planning, the shooter drives to Vision H.S. with a variety of firearms and a large supply of ammunition. It is mid-morning and all students are in classrooms or the gymnasium. He enters through a back door of the gym and immediately confronts the lead gym instructor, whom he shoots without hesitation. He then starts shooting at close to 100 students in the gym; several are hit and the rest scatter, most escaping through the main entrance. The shooter follows at a measured pace, firing random shots as he moves.

The gym’s GDAS sensor immediately detects the gunshots. A signal is automatically sent to the SS Incident Response Center and then every teacher on site, the principal’s office (including a personal mobile device) and the local police department. The internal CCTV system is immediately re-oriented to the location of the shooting; feeds are sent to the principal’s office and the local police department. As school staff initiates lockdown procedures, the principal returns to his office and creates an open line with police responders. He is able to locate the shooter by means of the CCTV system and update them with a description and location.

As fire and EMS units stage across the street from the school, several police units enter the campus and proceed quickly to the shooter’s last reported location. They are able to do this quickly because the school layout is accessible on their in-car computer screen and dispatch has an open line with the principal. Both officers have been trained in “active shooter” responses and one is equipped with a high-capacity, semi-automatic rifle. As they quick-peek around a corner, they see the shooter attempting to force his way into a classroom by breaking out a window. As the shooter spots them, he turns to fire, but the officers immediately shoot him fatally. The school is immediately cleared, while fire and EMS begin treating the injured students and gym instructor. The total time elapsed has been 7 minutes. The GDAS system detected the threat, sent out alerts to school staff and notified 9-1-1 in less than 30 seconds. Lockdown of the campus was accomplished in less than two minutes; this was before the shooter exited the gym. Police units were on scene in less than 5 minutes and located the shooter within 90 seconds. The only casualties are in the gym. Timely fire and EMS response has resulted in successfully controlling several cases of severe bleeding. The GDAS system has shaved close to 10 minutes from the threat detection-protective actions-9-1-1 notification cycle. School staff was able to implement protective measures promptly, well before the shooter exited the gym and tried to locate an unlocked classroom. The principal knew immediately that the gunshot detection system had activated; consequently, his best course of action was to immediately return to a safe area and begin the process of incident management. Police responders had precise information about the shooter’s description and likely location; they had also been trained to move quickly, engage the shooter and defeat the threat.