



Case study



MOTOROLA SOLUTIONS

World's First AI-enabled and Integrated Weapons Detection and Screening System for K-12 Schools

Motorola Solutions Concealed Weapons Detection (CWD), Powered by Evolv Technology, Improves School Safety with Touchless, Seamless Screening

Organization Overview

INDUSTRY: Education: K-12

Use Cases

- AI-enabled touchless weapons detection and screening for entrances at school facilities and events

Solutions & Outcomes

Solution

- Motorola Solutions Concealed Weapons Detection Powered by Evolv Technology
 - Evolv Cortex AI™
 - Evolv Insights®

Outcomes



Protect students, staff, and visitors from mass casualty attacks and violence by detecting concealed weapons before they enter school buildings and facilities



Improve school-entrance experiences at numerous school entry points by eliminating security queues and minimizing intrusive weapons screening of students, visitors, and staff



Optimize security and school resources at different security entry points; reallocate to other areas for enhanced security



Leverage portable deployment options to implement screening quickly and easily at school entrances; relocate and reconfigure weapons detection systems for school events such as football games, graduation, concerts, theatrical performance, and parent meetings—both indoors and outdoors



Reduce threat risk and improve efficiencies via detailed weapons detection and screening reports for threat intelligence, student, staff, and visitor arrival curves and counts during normal school days and extracurricular school events, system detection performance, alarm statistics, and detection settings



Adjust security sensitivity settings based on weapon and event types



Increase parent confidence in the safety of their children while they are at school

Challenges

The return to in-person learning for many K-12 schools and higher educational institutions has introduced heightened awareness and concern around security and safety issues.

According to one report, three in four of school administrators indicate the COVID-19 pandemic heightened the importance of physical security in their organizations.¹ It is more than a change in processes that is needed: 72% of security and facility managers believe their physical technology priorities shifted and became a higher priority.

In the latest "State of School Safety Report," one-quarter of school administrators indicate their schools are unprepared to meet the new threats precipitated by a return to in-person learning—and the majority of students and parents concur with them.²

Weapon Discoveries in Schools Increase

Studies that examine weapon seizures in schools reveal a marked increase since schools reopened to in-person learning.

In New York City, for example, a total of 787 weapons were discovered from July to October last year. During the same timeframe in 2019 (viz., before the COVID-19 pandemic), there were 612 weapon seizures, including only one firearm.⁴

It isn't simply happening in New York City. Late last year, as an example, seven guns were found in North Carolina schools in one week.⁵ Thankfully, these incidents did not result in harm or death to anyone, which is unfortunately what occurred in early December at Oxford High School in Michigan when a teenage student killed four students and injured another seven with a handgun.⁶

- ▶ 8 in 10 parents admit that they are concerned about the physical safety of their school-age children.³

¹ "Brivio Smart Security Trends Report: Physical Security Disruption in the COVID Era," March 2021.

² "2021 State of School Safety Report: Issues of Critical Importance Impacting Safety As School Resumes During COVID Evolution," Safe and Sound Schools, accessed February 12, 2022.

³ "Harris Polls Shows Physical Security Is Crucial to Getting Kids Back to School," Evolv Technology Blog Post, December 20, 2020.

⁴ Selim Algar and Tina Moore, "NYC schools see 28 percent spike in weapons seizures," New York Post, October 27, 2021

⁵ "Wake sheriff meeting with lawmakers after 7 guns found at NC schools this week," WRAL.com, December 9, 2021.

⁶ Ben Chapman and Kris Maher, "Michigan School Shooting Suspect, Parents Met With School Officials Hours Before Attack," The Wall Street Journal, December 1, 2021.

This upward trend reflects weapon-related violence during COVID-19 in general, which shot up 30% over the previous year.⁷ According to the Gun Violence Archive, there were 343 more mass shootings (viz., where four or more people were killed or injured), 217 people killed, and 1,498 people injured in the U.S. between April 2020 and July 2021 as compared to the previous 15-month timeframe.⁸ A study by Everytown For Gun Safety found that the 2021 back-to-school period (viz., the first six weeks of school) saw the highest number of gunfire incident on school grounds since it started tracking data—a number that is almost double from the previous high (30 compared to 16).⁹

Even before the pandemic, assaults in schools with a weapon doubled in the two most recent school years for which the U.S. Government Accountability Office gathered such data.¹¹ Beyond students, staff, and visitors who might be harmed when violence erupts at a school due to the use of a weapon, there are long-lasting negative repercussions on those who were simply present. A recent study, for example, found the following to be the case when a gun was involved:¹²

- More likely to be chronically absent from school and repeat a grade
- Less likely to graduate high school, enroll in college, or earn a bachelor's degree
- Less likely to hold a job as a young adult
- Earn 13.5% less than those who attended school during the same timeframe when the shooting took place

One-third of parents believe their child's school has inadequate security measures in place.¹⁰

Failings of Traditional Weapons Detection and Screening Approaches

Schools continue to add more security measures to address growing concerns about violence and weapons.

As of 2019, over three-quarters of schools had security guards and/or assigned police officers, 86% had one or more security cameras to monitor school grounds, and almost 12% had metal

detectors in place.¹³ Though no definitive reports exist, indications are adoption rates continued to increase with the return from the pandemic.

⁷ Alan Mozes, "[U.S. Gun Violence Jumps 30% During the Pandemic](#)," U.S. News & World Report, October 22, 2021.

⁸ "Gun Violence Archive," accessed February 13, 2022.

⁹ Katherine Fung, "[School Shoots Nearly Double as Students Return from Remote Learning](#)," Newsweek, October 5, 2021.

¹⁰ "[2021 State of School Safety Report: Issues of Critical Importance Impacting Safety As School Resumes During COVID Evolution](#)," Safe and Sound Schools, accessed February 12, 2022.

¹¹ Andrew Ujifusa, "[Violence, Hate Crimes in Schools Surged in Pre-COVID Period, Federal Watchdog Finds](#)," EducationWeek, November 29, 2021.

¹² Marika Cabral, et al., "[Trauma at School: The Impacts of Shootings on Students' Human Capital and Economic Outcomes](#)," National Bureau of Economic Research, December 2020.

¹³ "[Percentage of students who reported selected security measures at schools in the United States from 2001 to 2019](#)," Statista, October 2020.

Traditional screening approaches that rely on walk-through metal detectors, hand wands, and invasive bag checks are problematic. Walk-through metal detectors and hand wands are based on decades-old technologies that are highly inefficient and fraught with false positives. The reality is that they simply cannot scale to the screening volumes demanded by school environments where hundreds of students and staff must be checked at the beginning of the school day. Upwards of 40% of those who are screened get flagged for a secondary check of their person and any bags they are carrying.¹⁴

The resulting queues create frustration and security risk with large groups of students forming outside of school entrances waiting while other students pass through walk-through metal detectors, checked with a hand wand, and/or have their bags screened for potential weapons. These entrance “pools” present security risks themselves—for students and non-students to perpetrate violence (e.g., drive-by shootings) on crowds of students. The long waits to get into schools also prevents students from getting to class on time while creating heightened anxiety and stress.

► Three-quarters of parents are concerned that security screening creates lines.¹⁷

When a potential weapon is detected by walk-through metal detector, operators are unable to tell the difference between everyday metal items and actual weapons. They also don't know the location of the threat on the person's body or bag. As a result, security personnel must search the student's entire body and bags. Hand-held wands and/or pat downs require more staff and are intrusive. As such, they also require physical contact between the security staff and the student.

And while parents indicated in a recent survey that walk-through metal detectors are needed in schools, they also cite a number of concerns associated with them. More than one-third indicated that the long lines resulting from the screen process is a concern, with over three-quarters citing the security guards touching belongings of their students as a problem.¹⁸ The psychological effects of traditional threat detection systems are also an issue: Almost one-third of people in general indicate walk-through metal detectors make them anxious and irritated while 16% said they make them fearful.¹⁹ These numbers are for the general population, and the impact is higher for students who are typically more sensitive to such experiences. The false alarms generated by walk-through metal detectors also ratchet up the anxiety and stress felt by students waiting in long queues and wondering if they will make it to class on time.

Certainly, concerns about physical contact resulting from security-line queues, back checks, and hand-held wand checks are much higher today than before COVID-19. Two-thirds of parents said they will not join a line that lacks social distancing, and three-quarters cited security guards touching student belongings as a problem.²⁰

¹⁴ Based on data compiled by Evolv Technology.

¹⁵ "Harris Polls Shows Physical Security Is Crucial to Getting Kids Back to School," Evolv Technology Blog Post, December 20, 2020.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Ibid.

Siloed Security Operations and Intelligence

Security operations with traditional security approaches that use walk-through metal detectors and hand-wand checks lack integration with security operations such as video security systems, radios, and other technology components.

School security teams lack centralized intelligence that combines all of these into one hub that facilitates rapid response when a potential threat does occur. As a result, they are unable to employ artificial intelligence (AI) to correlate the data and use predictive analytics to manage risk and react in virtual real time to threats. For example, a threat detected on video surveillance should trigger radio alerts to security and facility managers, including those managing CWD systems at school facility entry points. At the same time, a weapon detected and found on a student should be captured on video cameras at the entrances—which is immediately available for the security operations team to review—and generate alerts on radios carried by security and facility staff.

Integration of security technologies and operations was cited by 61% of school security and facility personnel as their top security goal.¹⁹ Budget and resource constraints exacerbate the situation.

As a result, concealed weapons screening, identity and access control systems, alarm systems, visitor management, and radios must be integrated into a central hub. Security integration also plays a crucial role in helping schools to demonstrate how they are reducing their security liabilities to school boards, insurance providers, parents, and the general public. Overstretched school security personnel simply do not have the time to aggregate data into centralized reports from multiple unintegrated systems.

► 61% of schools list integration of security systems and operations as their top security priority.²⁰

Next-generation Weapons Screening, Monitoring, and Management for Schools

Weapons screening in schools must balance the need to protect students and staff against providing a welcoming environment that promotes learning and the wellbeing of students.

The safety of students is an utmost priority for parents and staff. But they also concur that weapons screening cannot negatively impact students—whether causing them to be late to class,

creating potential safety issues by creating queues of students who could be threatened outside of school entrances, or increasing anxiety, stress, or even fear.

¹⁹ "Brivio Smart Security Trends Report: Physical Security Disruption in the COVID Era," March 2021.

²⁰ Ibid.

Schools require weapons screening that can scale to handle significant fluctuations in volumes of students, staff, and visitors at the beginning of the school day as well as other spikes in the number of entrance broken down to small time increments. And with various events—both indoors and outdoors—such as football games, track and field events, concerts, school board meetings, and theatrical performances, schools need weapons screening systems that are portable and provide them with the ability to adjust security sensitivity. Weapons security screening systems must be easy to set up and operate, as teachers and other staff often need to supplement security staff during peak ingress periods. Finally, schools require integrated and consolidated physical security operations and data into a single pane of glass for real-time incident response and seamless reporting.

The answer to these challenges and requirements is Motorola Solutions Concealed Weapons Detection (CWD) powered by Evolv technology, which enables schools to accelerate physical security screening for students, staff, and visitors while maintaining the highest degree of weapons detection accuracy. The weapons detection and screening solution delivers a touchless weapons screening experience and the ability to screen up to 4,000 people per hour—10 times faster than walk-through metal detectors. There is no more “pooling” of students in front of school entrances, as students are able to quickly enter schools—even walking side by side—and get to their classes in time. At the same time, the weapons screening process is seamless, eliminating the anxiety and stress that often come with walk-through metal detectors.

Motorola Solutions CWD, includes the Evolv Express® weapons screening system powered by Evolv Cognition AI™ software platform that integrates and processes data from multiple sensors and constantly learns. It also includes the Evolv Insights® analytics dashboard that delivers consolidated weapons screening system performance, visitor flow, and location-specific performance.

The false positives of a traditional walk-through metal detector can overwhelm a security team at a school—with upwards of 40% of students, visitors, and staff flagged for secondary weapons screening. Motorola Solutions CWD reduces this dramatically—to between 2% and 20% depending on the environment and level at which security sensitivity is set—all without sacrificing accuracy and safety.

As fire drills are a frequent occurrence at schools, they introduce significant challenges when schools employ walkthrough metal detectors and hand-held wands for weapons detection. In particular, long queues can form when students mass to reenter school facilities following a fire drill. However, as Motorola Solutions CWD can screen 10x students and staff following a fire drill, students and staff can pass through weapons detection screening quickly and securely without forming lines and returning late to class.

Key capabilities Motorola Solutions CWD offers schools include:

- **Accurate threat detection.** Motorola Solutions CWD is powered by high-speed sensors and Evolv Cortex AI™ software that identifies threats in real time without requiring students, visitors, and staff to stop, empty their pockets, and remove and open their bags. Trained on nearly 50,000 object scans that include multiple types of firearms as well as everyday items students, visitors, and staff carry in their pockets and their bags, Evolv Cortex AI knows the difference between ordinary everyday items like smartphones, keys, and coins versus weapons. Machine learning algorithms analyze aggregated data in a controlled environment that is overseen by the Evolv R&D team. This data is leveraged by Cortex AI to determine true threats from harmless objects in real time.
- **Touchless experience.** When a potential threat is detected, Motorola Solutions CWD delivers an image to the operator on a tablet in real time. The image includes the location of the threat on the body of the student, visitor, or staff as well as the location of the threat in their bag. As a result, whereas security personnel must search the student's, visitor's, or staff's body and/or bag for the potential threat, only the location where the threat was identified needs to be searched with CWD. Thus, for example, if a threat is detected on the ankle of a student, then security staff as the student, visitor, to reveal what is on their ankle. Likewise, if the threat is pinpointed in a student's backpack, then only it is searched. As a result of sensitivities around COVID-19, minimization of physical interactions between security personnel and students and visitors is important for many—from parents, to students, to visitors.
- **Portable use** Unlike walk-through metal detectors that can only be used indoors and moreover are difficult to move once they are installed, Motorola Solutions CWD can be used indoors and outdoors and can be quickly and easily relocated and reconfigured—both single and dual lanes—in new settings. This is a big advantage for schools that have weapons screening requirements that include theatrical productions, football and basketball games, and school board meetings, among others. The portability of the CWD enables schools to ensure the same level of concealed weapons security screening exists at extracurricular events and various school venues as at school entrances during the regular school day.
- **Flexible security settings.** Not every school day, entrance, and event warrant the same level of weapons security scrutiny. Motorola Solutions CWD can be configured with five different detection sensitivity settings that schools can dial up and down based on the threat level of that particular day, event, or entrance. Thus, when threat circumstances dictate an increased security screening, then school security personnel simply increase the sensitivity setting on the CWD.
- **Insights and analytics.** Walk-through metal detectors do not capture detailed analytics, such as arrival curves and counts, detection performance, detection settings, and alarm statistics. Motorola Solutions CWD empowers school security personnel to review, analyze, and act on these types of analytics. Potential outcomes include streamlined staffing operations, improved student, visitor, and staff flow, and optimized ingress safety and experience.
- **Easy to manage and learn.** Most schools cannot hire enough full-time security staff to manage weapons security screening during peak times of ingress. In these instances, teachers, administrators, and other staff can be used to supplement security personnel. Walk-through metal detectors require training and are only as good as the person's vigilance in operating them over time. Motorola Solutions CWD is easy to deploy and manage, requiring minimal training—even for staff without a security background. Threats are color-coded on handheld tablets, enabling different responses based on the type of threat identified while also pinpointing the location of the suspected threat. This facilitates self-paced learning for school staff used to supplement school security personnel when students arrive at school.

Consolidated Security in Motorola Solutions Avigilon Technologies

Motorola Solutions has partnered with Evolv Technology to integrate Motorola Solutions CWD, powered by Evolv Technology, with Avigilon Control Center (ACC), Motorola Solutions' video security management system, as well as Avigilon H5A Modular Cameras, Motorola Solutions' advanced analytic security cameras. Integration with ACC also facilitates integration with Avigilon Radio Alert.

Advanced Analytic Avigilon Modular Cameras

Avigilon Modular Cameras are designed for areas with limited space and those that require discreet and unobtrusive monitoring—both of which exist in many school locations. The Avigilon cameras are equipped with Next-Generation Video Analytics

and other advanced analytics capabilities that enable rapid object classification in crowded school environments—which speeds incident response for critical events.

Avigilon Control Center Integration

Security alarms from CWD appear in real time in ACC, immediately notifying security operations screeners of a detected threat. As Avigilon analytic cameras are installed on the towers of the CWD and stream live video to the ACC, which is recorded alongside fixed video security feeds from other Avigilon cameras installed in the school facility, school security personnel can quickly react to threats with the appropriate action.

Weapon alerts from the Motorola Solutions CWD are sent to the security operations center (SOC) via the ACC as well as through voice alerts on various Motorola two-way radios. This redundancy helps ensure that the alerts are received and generate appropriate responses, even when SOC personnel are busy handling other security situations.

For schools with long-term security plans, they can seamlessly add and integrate video surveillance systems, such as ACC and Avigilon Modular Cameras, into their CWD system deployment without incurring additional cost or time.

Motorola Solutions CWD can screen up to 10x the number of people per hour compared to walk-through metal detector solutions while using 70% fewer security staff.

Avigilon Radio Alert Integration

Avigilon Radio Alert integrates advanced AI and video analytics in the ACC for communications over two-way radios to all school security personnel.

Alarms are dispatched directly to two-way radios via text message and/or text-to-voice alerts—which is critical for rapid and effective incidence response.

No Face Mask Detection

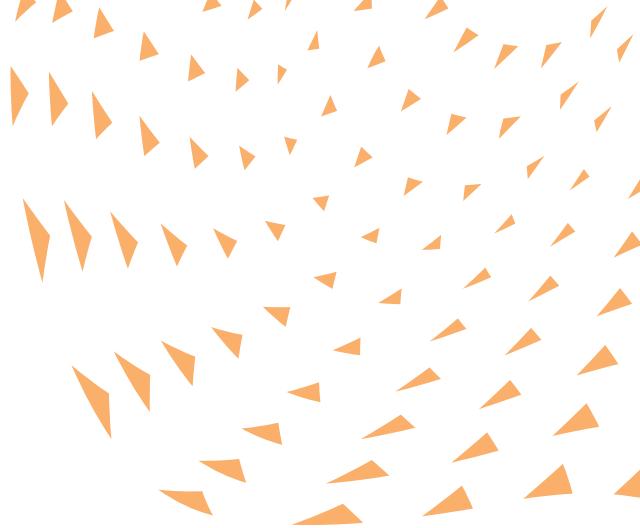
For schools with face mask policies, Avigilon Appearance Search technology is integrated into the Avigilon Modular Cameras that are positioned on CWD towers for viewing faces. Avigilon Appearance Search Technology not only pinpoints students, staff, and visitors who are not wearing face masks but identifies other areas in school facilities where they may have been.

Automated face-mask policy violation alerts feed into the ACC, ACC Mobile 3, and Avigilon Radio Alert systems. The analytic-powered Avigilon suite of integrated security technologies also provides schools with optional historical reporting and analysis that security personnel can use to determine levels of compliance with face mask policies (e.g., department, building, time of day, etc.).



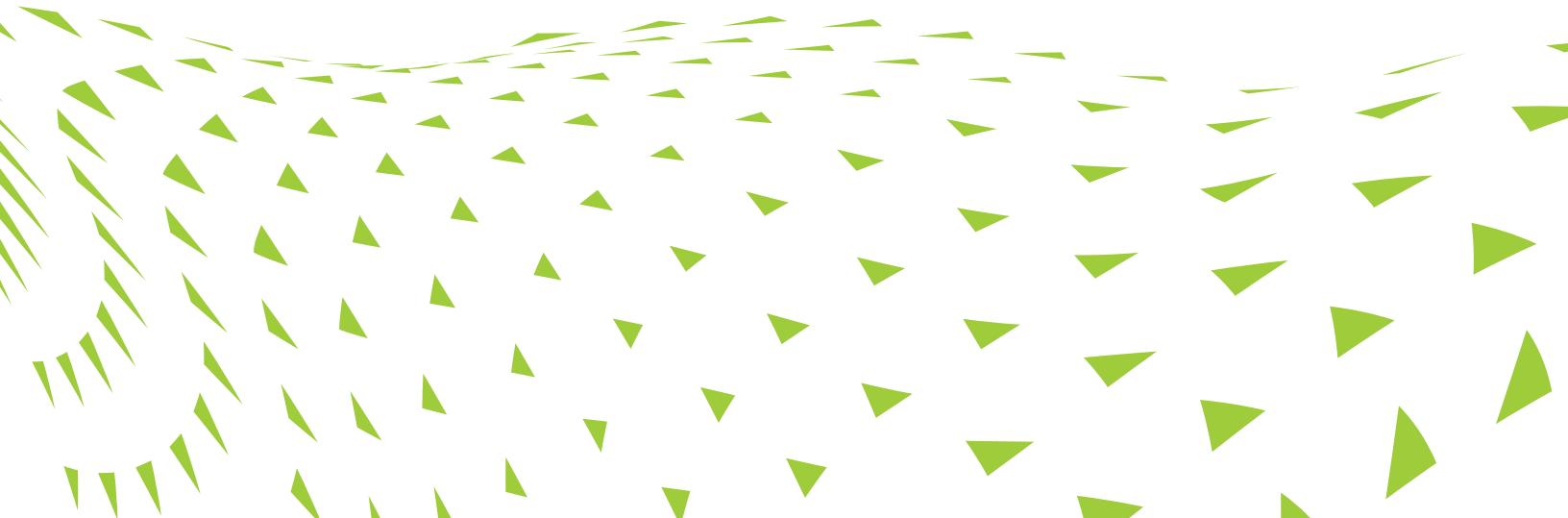
Additional Resources:

[Motorola Solutions Concealed Weapons Detection \(CWD\)](#)



Contact us to learn more about how to protect your workforce
and facilities with touchless security screening.

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