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SIGMA:

ELEVATING SITUATIONAL AWARENESS TO PREVENT ATTACKS

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Why Sensor-Agnostic Data Aggregation is the Key to Security in an Evolving Global Threat Landscape

Nine nations have the capability to create a nuclear weapon. Should any component of these weapons (or the materials needed to make them) go rogue or missing, international tension and the potential for nuclear catastrophe could rise to levels unseen since the Cuban Missile Crisis.

The question then arises: How can government organizations with missions related to homeland security, antiterrorism, and the protection of first responders prevent this from happening in the U.S. homeland and for critical allies and partners?

Federal, state, and local entities must enact the proper policies, processes, and, most critically — tools — that enable fast, accurate, and effective threat detection. As such, sensors essentially exist everywhere to detect information about gamma rays, neutron rays, and other critical signs of chemical, biological, radiological, nuclear, and explosive (CBRNE) materials.

But there's a critical problem: More often than not, there is no centralized location in which to view and contextualize sensitive and historically relevant information. This puts national security at stake. In other words, it's a challenge to access a consistent network of information needed to address and contain threats.

We must come face-to-face with the worst-case scenario. If information about hazardous or destructive material is not networked and made available to subject matter experts (SMEs) and key decision makers, it may reach key players too late to stop an impending disaster, accident, or attack.

Federal organizations need a centralized platform that quickly, reliably, and accurately networks sensitive data from disparate detection sources to make real-time national security decisions. That's where SIGMA comes in.

Detecting Weapons of Mass Destruction: How It Was Done Before

Methods of detecting weapons of mass destruction are deeply intertwined with the evolution of warfare and terrorism throughout human history.

It All Started With A Bomb

The earliest massive threats to national security were bombs — the traditional metal-and-explosive kind. In these cases, early detection methods often relied on visual inspection or manual searching techniques. For example, during World War II, bomb disposal units utilized basic tools and expertise to locate and defuse explosive devices planted by enemy forces.

However, these methods were labor-intensive, dangerous, and often ineffective in preventing bombings or mitigating their impact. Furthermore, they could not address the high-speed emergence of an entirely different strain of weapons: Biological and radiological/nuclear threats.

Biological and Radiological/Nuclear Threats

Hostile adversaries may no longer default to bombs to target cities or other high-risk areas. Nowadays, it may be a pathogen that renders civilians ill or a radioactive nuclear threat that poisons a small population at an event. Threats can even include radio frequency weapons impacting personnel at critical locations, such as an embassy or a military base.

WMD DETECTION METHODS: Weapons of mass destruction are more targeted, more capable, and more threatening than ever before. Traditional methods of CBRNE detection can't identify all of these cases. As such, detection methods evolved to include the following:

Biosensors: These devices detect biological agents potentially hostile to a population, such as bacteria, viruses, and toxins. They utilize biological molecules (typically enzymes or antibodies) to detect specific bio targets.

Neutron Activation Analysis: This method identifies trace elements from a sample by bombarding it with neutrons and measuring its gamma radiation. As such, it can detect and quantify elements and radionuclides associated with nuclear material.

Immunological Assays: Using antibodies, this method can detect specific antigens associated with biological threats. These typically can be performed in the field with minimal equipment.

Gamma Spectroscopy: Gamma spectroscopy identifies and quantifies the radioactive radionuclides present in a sample by analyzing the energy spectrum of gamma rays emitted. This method is commonly used in conjunction with radiation detectors to identify targeted radioactive materials.

Challenges Still Exist

Detection of weapons of mass destruction has certainly come a long way from WWII bomb identification. However, even the most advanced CBRNE detection methods have significant challenges in the modern threat landscape.

Time

When it comes to detecting hazardous materials, time is of the absolute essence. Old-hat strategies around detection typically lack the ability to glean real-time insights or monitor objects or materials of interest — much less transport these insights into an easily viewed centralized interface.

Manual searches can be time-consuming, especially in crowded areas like airports, concert halls, or train stations. Additionally, bottlenecking at X-ray machines or metal detectors can cause delays, which pose a major threat to ensuring national security. Problems arise even with more up-to-date methods, such as sensors, as it can take time for information detected by sensors to reach the right decision-makers.

Plus, biological and radiological/nuclear detection methods must occasionally be performed in a lab for certain confirmation. This can be inefficient and costly and ultimately result in threats being detected too late — compromising national security.

Accuracy

Traditional strategies lack the ability to quickly determine if detected materials are harmless occurrences or constitute a substantial threat. False positives and false negatives are common occurrences, leading to unnecessary alarm or overlooking potential threats.

Take detection canine teams, for instance, who may sometimes react to non-threatning materials due to various environmental factors. Additionally, ultra-sensitive sensors may indicate the presence of hazardous material when it, in fact, is harmless (i.e., naturally occurring radiation) or in authorized use (i.e., medical treatment).

Contextualization

Perhaps most critically of all, older methods of destructive material detection lack the ability to contextualize the information they analyze. In other words, they lack the ability to quickly and efficiently network disparate sources of information together to make critical decisions. Without sufficiently networked information, personnel tasked with ensuring national security may struggle to distinguish between harmless items and genuine threats. They may also be faced with responding to only a percentage of alerts in the blind due to manpower limitations.

CONTEXTUALIZATION ISSUES IN ACTION

Consider bomb detection at airports. Traditionally, bomb detection in these spaces relied heavily on identifying specific characteristics of explosive materials through X-ray scanning or trace detection. Now, airports also rely on integrating AI-driven threat assessment systems as well as sensors and surveillance sources to collect critical insights quickly.

What security safeguarders need is a centralized location for that data to live — enabling access to networked information. Otherwise, it can be extremely difficult for decision-makers to see all the information they need to make the right choices quickly to protect national security.

Get A Unified Operating Picture

Sensor Agnostic Data Aggregation Analytics Platform (SIGMA) was built as the ideal partner to fill the gaps and overcome those challenges. Our solution can network disparate sensor types and contextualize their data without siloed software solutions for each separate sensor.

When we say sensor agnostic, we really mean it. SIGMA supports a variety of manufacturers' products with a large existing CBRNE sensor library, meaning your teams can rely on us to aggregate all the data you need when you need it. Additionally, we have an intuitive UX with real-time alerts, live data, and sensor health monitoring to ensure reliable uptime and rapid detection of CBRNE materials.

Our platform also includes operational and historical context for alerts, reducing false positives. With our ability to rapidly consolidate sensor data across disparate and distributed networks, we can easily disseminate data and enable better accessibility for decision-makers.

We work as the connective tissue between highly sophisticated sensors and CBRNE detection strategies to facilitate the communication security personnel need in high-pressure, time-sensitive day-to-day operations. Most critically, we're an operational platform enabling CBRNE detection at scale — which is especially critical in a modern landscape of constantly growing and shifting global threats.

SIGMA is ATO-approved, SOC 2-certified, and EU GDPR Privacy Rights certified, meaning we uphold critical standards for safety and security across states and nations. We built SIGMA to meet threats as they grow and expand. Our platform has the capability to ingest very large streams of data and scale from 1 to 10,000 with ease.

SIGMA's Origin Story

It all started with a question: What if we could build an automated detection system that was always on, adapting in real-time, easy to use, and easy to scale and sustain? These are the rules of DARPA's SIGMA program.

We built SIGMA to focus on the high-speed, accurate, and centralized detection of CBRNE materials. Our platform is a nine-year DARPA R&D effort, culminating as the result of $10 million in funding, a collaborative human network of highly specialized professionals in the CBRNE space.

We developed SIGMA to protect large populations at risk and respond to threats with unprecedented speed and accuracy — allowing critical players to make better, faster decisions with advanced analytics that improve situational awareness and increase the operational effectiveness of sensor programs.

In other words, SIGMA is the sensor-agnostic automated detection system that helps prevent disasters quickly, on a large scale, far before they happen.

Sigma's Impact

Secure Any Situation

Our role is to help aggregate, collect, and centralize data from sensors on threats/substances so that key decision-makers can make the right decisions in any situation:

- In preparation for large-scale / highly populated events.
- During routine public safety patrols.
- To monitor at-risk personnel or populations.

SIGMA is sensitive enough to detect threats in a sizable theater. For example, during a large-scale event, SIGMA was able to immediately detect and report on the presence of a targeted medical radionuclide to C2 personnel. This allowed them to make the critical, time-sensitive decision to send additional resources to investigate the radionuclide further.

Scale Specialty Skills

There are a limited number of people trained to detect CBRNE materials. SIGMA helps entities tasked with such responsibilities work better and faster and allocate resources where they're needed most.

SIGMA is optimized for chemical, biological, radiological, and nuclear detection efforts, which average law enforcement groups are not inherently prepared (nor do they have the bandwidth) to address. Our solution supports those highly specialized teams to hone in on suspect/suspicious materials and stabilize national security.

SIGMA is Ready-Made for Essential Use Cases

Large Events

Our platform is prepared to safeguard and ensure accurate and real-time CBRNE material detection at large events — such as sporting events, marathons, and parades. These large-scale events typically bring together multiple agencies and vendors using different brands of sensors, from which SIGMA can pull together and contextualize data. SIGMA users can also utilize our solution 24 hours prior to the large event to create a foundational architecture of radionuclides already around the environment, detecting and ruling false positives for better accuracy and a baseline to measure against the next day.

Routine Environmental Scanning

Any city can use SIGMA to interpret sensor data collected from public safety personnel who patrol large areas (for example, data collected via wearable sensors on members of a police force). Collecting information from an environment with a large physical footprint can help public safety organizations pinpoint locations of interest in which to deploy additional resources and sensors to pursue leads.

Public Service

SIGMA can provide public service entities with another line of defense against critical threats — and just as critically — enable them to instill the general public with a sense of safety and security. For example, potential radiation poisoning can cause chaos, fear, and paranoia and quickly overwhelm medical staff and medical facilities. SIGMA has the power to quickly and accurately identify what possible radiation people were exposed to, if they even were exposed, how much exposure they have, and whether or not that exposure is even dangerous.

New Horizons

There are growing possibilities with SIGMA that have the potential to make game-changing strides in national security. Some theoretical future use cases include:

Drug Detection

New adaptations and upgrades within SIGMA could make our platform ideal for networking the detection of drugs like fentanyl. For example, sensors could be utilized by disparate law enforcement agencies to uncover a string of fentanyl detections that show up anywhere from Boston to Miami. From there, SIGMA could do predictive analysis about fentanyl trafficking patterns and assist in mitigating the illegal drug trade.

Pre-sensing Sickness or Diseases

SIGMA technology could be used to network wearables (like Garmin watches and Oura rings) to run micropulse data through an algorithm and predict diseases of interest — such as COVID-19, Ebola, or other potential outbreaks.

Disaster Relief Planning / Evacuation Route Planning

SIGMA could assist in plume detection, which helps predict how a chemical release will spread and which areas of a city will need to be evacuated or require aid in those instances. This can help cities create effective disaster recovery plans and evacuation routes.

Threat or Not? Distinguishing Signals

SIGMA can alert SMEs to the detection of everyday CBRNE material or potentially hazardous radionuclides while also providing the data to make a determination of whether or not to investigate further. For example, if our platform displays an alert that's showing certain signals/radionuclides, we can show spectral data of those radionuclides and whether they present a legitimate threat or are something more routinely found in everyday life (i.e., radionuclides from sources found occurring naturally in the environment). With this information, entities can more strategically deploy resources to pursue real threats — without getting distracted by false positives.

Making the World Safer with SIGMA

Protectors of national security have a growing need to detect, analyze, and respond to threatening materials with unprecedented speed and accuracy that's impossible with non-networked sensors alone.

SIGMA offers a comprehensive platform to aggregate sensors and streamline data collection, analysis, and dissemination in one centralized place — empowering authorities to respond quickly and efficiently to potential threats.

By leveraging SIGMA, critical decision-makers can significantly enhance their ability to protect citizens, infrastructure, and national security at large events and in public spaces, preventing disasters and protecting populations from catastrophes.

Whether you're a vendor, a public service entity, or a federal agency, SIGMA can help your organization. Get in contact with us today.

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