TR9+ SENTRY

Chemical Threat Detection System

Letter from Scentroid's CEO

Scentroid's mission is to empower our clients with vast in-depth knowledge, state-of-the-art instruments, and the most extensive customer support. To this end, we strive in every aspect of our operation to put our client first and to use our research expertise to develop the most innovative and effective products and services in the sensory industry. We envision a future where environmental impacts will be easily and accurately measured and mitigated.

Dr. Ardevan Bakhtari
CEO, Scentroid

Mobile Chemical Threat Detection Platform

The Sentry is a multi-sensor air monitoring system designed for rapid detection of chemical warfare agents, toxic industrial chemicals, combustion byproducts, and radiological hazards.

Sentry provides real-time situational awareness in environments where airborne contaminants pose immediate risk to personnel, infrastructure, and surrounding populations.

The Modern Chemical Threat Landscape

Airborne chemical Hazards are increasingly complex. Modern incidents rarely involve a single chemical threat. Military attacks, industrial sabotage, and infrastructure failures often produce complex airborne mixtures of toxic gases, particulates, and volatile compounds.

Effective response requires rapid detection and identification of Chemical warfare, Toxic Industrial Chemicals, or Radiological Materials.

Chemical Warfare Agents

Blood agents, choking agents, nerve agents, and blister agents remain among the most dangerous airborne hazards due to their high toxicity and rapid physiological effects.

Toxic Industrial Chemicals

Industrial facilities store and process large volumes of hazardous chemicals. Damage to refineries, fertilizer plants, semiconductor fabrication facilities, or chemical manufacturing plants can release dense toxic plumes that spread far beyond the point of origin.

Radiological Materials

Explosive dispersal of radioactive material (“dirty bombs”) presents a combined chemical and radiological monitoring challenge.

Sentry provides multi-sensor detection capabilities to support military reconnaissance, emergency response, and infrastructure protection operations.

Introducing the Scentroid Sentry

Sentry is a mobile, multi-sensor atmospheric monitoring platform designed to detect and characterize airborne hazards in complex operational environments.

- **Equipped with up to 18 sensors:** The TR9+ provides comprehensive detection of hazardous pollutants, chemical warfare agents (CWAs), and radiation threats within a single, unified system.
- **Military-Grade Chassis:** IP67 rated, operationally ready for environments from -40°C to +50°C.
- **Secure Remote Data Visualization:** All critical data is encrypted and securely transmitted to a super-rugged field tablet as well as to a centralized command center.
- **Integrated Audible and Visual Alarms:** Crucial safety is ensured through built-in alarms that trigger instantly upon detection, providing an immediate warning to everyone in the vicinity, independently of the operator.


COMBUSTION BYPRODUCTS
Detects harmful gases produced during combustion processes such as fires, explosions, or industrial activity.
SCENTROID
TEAM C
Identifies and quantifies hazardous industrial chemicals that may be released from manufacturing facilities, transportation accidents, or storage failures
TOXIC INDUSTRIAL CHEMICALS
VOLATILE ORGANIC COMPOUNDS
Monitors a wide range of volatile organic compounds emitted from fuels, solvents, chemical production, and industrial processes.
Measures airborne particulate matter including dust, smoke, and fine aerosols that can impact respiratory health and operational safety
PARTICULATE CONTAMINATION
Designed to detect the presence of highly toxic chemical warfare agents and related compounds.
CHEMICAL WARFARE AGENTS
RADIOLOGICAL HAZARDS
Detects ionizing radiation and airborne radioactive contamination that may result from nuclear incidents, industrial sources, or radiological threats
SCENTROID
TEAM A
SCENTROID
TEAM B

Integrated Multi-Sensor Monitoring Platform

Sentry combines several complementary sensing technologies to provide broad-spectrum detection of airborne contaminants. Each sensor type is optimized for detection of specific chemical classes while operating simultaneously to produce a unified environmental assessment. Supported sensing technologies include:

All Clear

Safe to Stay:
Safe for all personnel for prolonged exposure (8+ hours), or standard atmospheric conditions

Amber Zone

Tactical Threat:
Choking Agents such as Cl2 or Phosgene, or Carcinogens such as Benzene, VOCs, UFPs, or O3

Red Zone

Immediate Threat Detected:
Nerve agents (Sarin, VX, Mustard Gas), Blood Agents (Arsine, HCN) or Potential Radiation Exposure

Electrochemical Sensors (EC)
Highly selective sensors designed for detection of specific toxic gases including hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, and hydrogen cyanide.

Photoionization Detection (PID)
Broadband volatile organic compound detection using ultraviolet ionization.

Electro-Polymer Sensors
Specialized sensors designed to detect highly toxic hydride gases such as arsine.

Thermal Fractionation - Photoionization Detection(TF-PID)
Selective chemical analysis capable of identifying nerve and blister agents at trace concentrations.

Laser Particle Counters
Optical monitoring of airborne particulate concentrations (PM1, PM2.5, PM10).

Radiation Detection
Gamma radiation monitoring for detection of radiological dispersal events.

Customizable Solutions for Every Environment

Scentroid understands that every monitoring environment presents unique challenges. The Scentroid Sentry platform is designed to be highly adaptable, allowing each unit to be customized to match the specific requirements of the deployment site. Systems can be equipped with direct sampling probes for targeted gas measurements, mounted on tripods for rapid field deployment, or wall-mounted for continuous fixed monitoring in industrial facilities.

For applications requiring mobility or access to difficult locations, the same sensor configurations can also be integrated into drone platforms, enabling airborne detection and remote inspection of hazardous or hard-to-reach areas. This flexible approach ensures that every Sentry system can be optimized for the environment in which it operates.

Custom Vehicle Mount Equippable

Scentroid UrbanScanner Compatible

Scentroid DR2000 Compatible

Scentroid Scentinal Compatible

CTair Compatible, Weather-Aware, and Self-Powered

The Scentroid Sentry integrates seamlessly with CTair monitoring systems while maintaining full environmental awareness and independent power for rapid deployment in any location.

- CTair Compatible: Fully integrates with CTair monitoring networks for expanded sensing capabilities.
- Ultrasonic Weather Station: Real-time wind speed, direction, temperature, and atmospheric data for contextual analysis.
- Solar Powered: Autonomous operation using a high-efficiency solar panel and onboard power management.

Direct Source Sampling with Probe Attachment

For targeted investigations, the Sentry can be equipped with an optional probe attachment that enables direct sampling from vents, pipes, confined spaces, or emission points.

- Probe-Based Sampling: Collect air directly from specific sources or confined environments.
- Enhanced Accuracy: Reduces dilution effects by measuring pollutants closer to their origin.
- Flexible Deployment: Ideal for industrial inspections, emergency response, and leak detection.

Versatile Deployment Platforms

Designed for adaptability, the Sentry can be mounted on a variety of platforms, including quadrupedal robotic systems, allowing monitoring in environments that are unsafe or inaccessible to personnel.

- Robotic Integration: Compatible with quadrupedal robotic mounts for remote operation.
- Difficult Terrain Access: Navigate rubble, hazardous zones, and complex industrial sites.
- Mission Flexibility: Deploy the same monitoring system across stationary, mobile, and robotic platforms

Chemical Warfare Agent Detection

Chemical warfare agents represent some of the most hazardous airborne threats due to their high toxicity and rapid physiological impact. Sentry supports detection of several classes of chemical warfare agents through specialized sensor combinations and analytical techniques.

Blood Agents

Blood agents interfere with cellular respiration and prevent oxygen utilization in the body. Examples include:

- Hydrogen Cyanide (HCN)
- Arsine (AsH3)

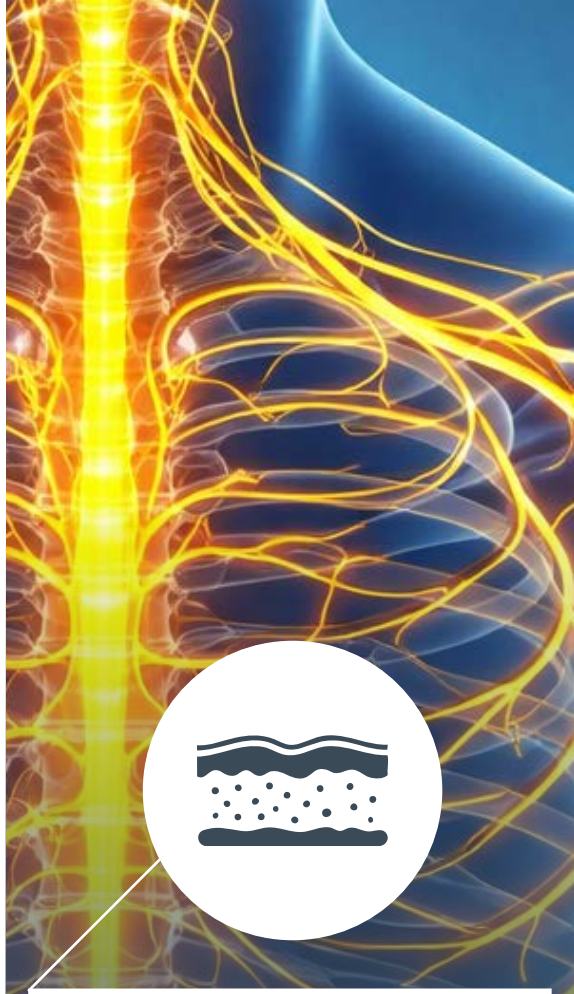
Detection is achieved using electrochemical and electro-polymer sensors capable of identifying these compounds at low concentrations.

Choking Agents

Choking agents damage respiratory tissue and impair lung function. Examples include:

- Chlorine (Cl_2)
- Phosgene ($COCl_2$)
- Hydrogen Chloride (HCl)

Electrochemical sensors provide selective detection for these gases at trace and hazardous concentrations.



Nerve and Blister Agents

Agents such as Sarin, VX, and Mustard Gas require advanced detection approaches due to their chemical complexity.

Sentry supports detection through PID-based monitoring combined with GC-PID analysis and pre-concentration techniques, allowing identification of trace concentrations of these highly toxic compounds.

Industrial Chemical Hazard Detection

Damage to industrial facilities can release large quantities of toxic industrial chemicals into the atmosphere.

These releases frequently generate dense toxic plumes that travel significant distances downwind, affecting surrounding communities and response personnel.

Sentry provides detection capabilities for a wide range of industrial chemical hazards including the following:

Refinery and Petrochemical Releases

Disaster may release large quantities of:

- Hydrogen Sulfide (H2S)
- Hydrogen Fluoride (HF)
- Sulfur Dioxide (SO2)
- Volatile organic hydrocarbons

Manufacturing Facilities

Disasters involving chemical manufacturing and plastics production facilities may release:

- Styrene
- Acrylonitrile
- Hydrogen Cyanide
- Phosgene

Metallurgic Operations and Mining

Metal processing and mineral extraction facilities can release:

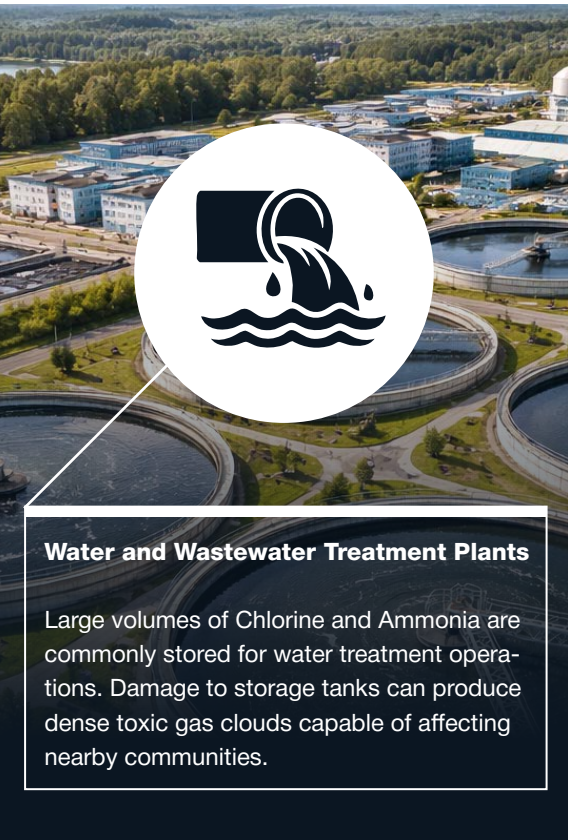
- Sulfur Dioxide (SO2)
- Hydrogen Cyanide (HCN)
- Carbon Monoxide (CO)

Critical Infrastructure Monitoring Protection

Many critical infrastructure facilities store or process chemicals that present significant risk if released intentionally or accidentally.

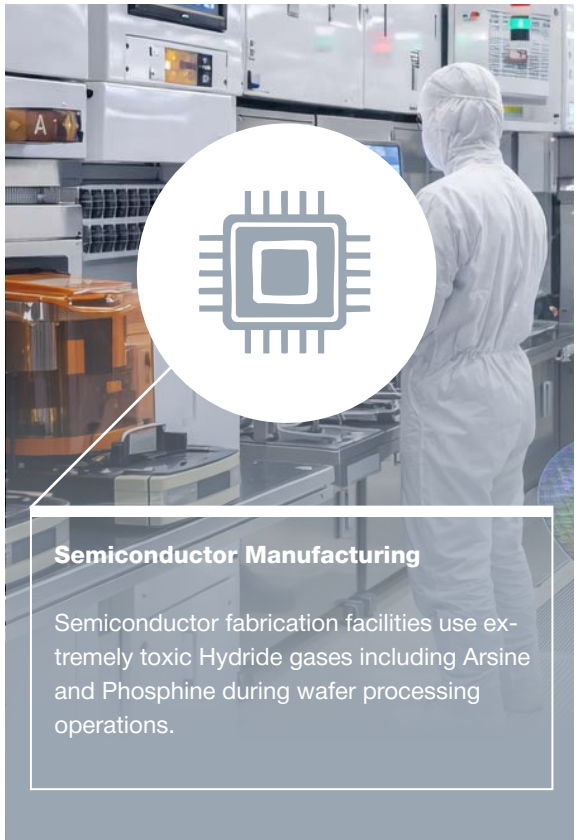
Sentry supports monitoring operations around sensitive facilities where airborne chemical hazards may threaten surrounding populations.

Examples include:



Water and Wastewater Treatment Plants

Large volumes of Chlorine and Ammonia are commonly stored for water treatment operations. Damage to storage tanks can produce dense toxic gas clouds capable of affecting nearby communities.



Semiconductor Manufacturing

Semiconductor fabrication facilities use extremely toxic Hydride gases including Arsine and Phosphine during wafer processing operations.

Plastics and Polymer Manufacturing

Production of polymers and plastics frequently involves chemicals such as Hydrogen Cyanide and Phosgene, both of which have historic use as chemical warfare agent

Food Processing and Cold Storage

Industrial refrigeration systems often contain large volumes of anhydrous ammonia. Catastrophic release events can rapidly create hazardous conditions.

RESPONDER

CONFIGURATION A: POST ATTACK / DISASTER RESPONSE

Mission: Detect Environmental Fallout

Deployed to: First Responders

Sensors:

- **Photo Ionization Detector:** Detects the massive initial cloud of pollutants. Essential for mapping the “Hot Zone.”
- **Electro-Polymer:** Arsine (AsH3), Hydrogen Sulfide (H2S), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2)
- **Electro-Chemical:** Hydrogen Cyanide (HCN), Phosgene (COCl2), Chlorine (Cl2), Hydrogen Fluoride (HF), Ammonia (NH3), Hydrogen Chloride (HCl), Carbon Monoxide (CO)
- **NDIR:** Carbon Dioxide (CO2), LEL (Combustibles/Methane)
- **Gamma Sensor:** High energy radiation
- **GPS:** High accuracy spatial mapping of all samples

DEFENDER

CONFIGURATION B: CWAS DETECTION / PERIMETER SECURITY

Mission: Detect Chemical Warfare Agents

Deployed to: Tactical and Hazmat teams

Sensors:

- **Thermal Fractionation (TP-PID):** Use of Selective thermal desorption to detect chemical warfare agents such as XV, Sarin and Mustard Gas in ppt level.
- **Electro-Polymer:** Arsine (AsH3)
- **Electro-Chemical:** Hydrogen Cyanide (HCN), Phosgene (COCl2), Chlorine (Cl2), Hydrogen Fluoride (HF)
- **Gamma Sensor:** High energy radiation
- **GPS:** High accuracy spatial mapping of all samples

Mobile Monitoring In Operational Environments

Sentry is designed for deployment in environments where rapid environmental intelligence is required to protect personnel and assess airborne hazards.

Typical operational deployments include:

- Military Reconnaissance
- Detection of chemical threats and toxic industrial hazards during military operations.
- Disaster Response
- Assessment of airborne hazards following industrial accidents, explosions, or natural disasters.
- Infrastructure Protection
- Monitoring sensitive facilities for accidental releases or malicious activity.
- Hazardous Materials Response
- Supporting emergency response teams with real-time air quality measurements during chemical incidents.

Gamma Radiation Detection

Gamma radiation is a form of high-energy electromagnetic radiation produced by radioactive materials, nuclear incidents, and radiological dispersal devices (RDDs). Because it is invisible, odorless, and capable of penetrating most materials, exposure can occur without warning, posing a serious threat to first responders and nearby populations.

Even low levels of exposure can accumulate over time, increasing the risk of acute radiation syndrome, long-term cancer development, and genetic damage. In disaster environments, such as damaged industrial facilities, nuclear infrastructure failures, or radiological attacks, rapid identification of radiation hotspots is critical.

How the Scentroid Sentry can help:

The Sentry's Integrated gamma radiation sensors continuously monitor background radiation levels and immediately alert personnel when abnormal spikes are detected. By mapping radiation intensity in real time, response teams can quickly identify contaminated zones, establish safe perimeters, and locate the source of radioactive materials before exposure escalates.

Key Operational Benefits

- Real-time detection of high-energy gamma radiation
- Immediate alarms when radiation exceeds background levels
- Hot-spot mapping to locate radioactive sources
- Integrated radiological and chemical threat awareness from a single monitoring platform

Superior Rugged Casing for All Environmental Needs

Engineered for extreme conditions, the Sentry features a rugged IP67-rated enclosure that protects sensitive instrumentation from dust, water, and harsh environmental exposure. The casing is manufactured from injection-molded CN-1 resin, a lightweight yet virtually indestructible material designed to withstand demanding field deployments.

Integrated water filters and internal compartment separations protect internal components while maintaining proper airflow and organization. The enclosure also features rubberized comfort handles, steel-pin reinforced hinges, and lockable latches for secure transport and long-term durability.

Key Features

- IP67 Waterproof & Dustproof: Rubber gasket seal protects against environmental intrusion.
- Injection-Molded CN-1 Resin: Lightweight yet extremely durable construction.
- Integrated Water Filtration: Prevents moisture ingress while allowing safe airflow.
- Internal Case Separations: Built-in compartments for organized and protected components.
- Rubberized Handles: Soft ergonomic grip for comfortable transport.
- Steel Pin Hinges: Reinforced hinge system for long-term strength and reliability.
- Lockable Latches: Add your own locks for enhanced security.

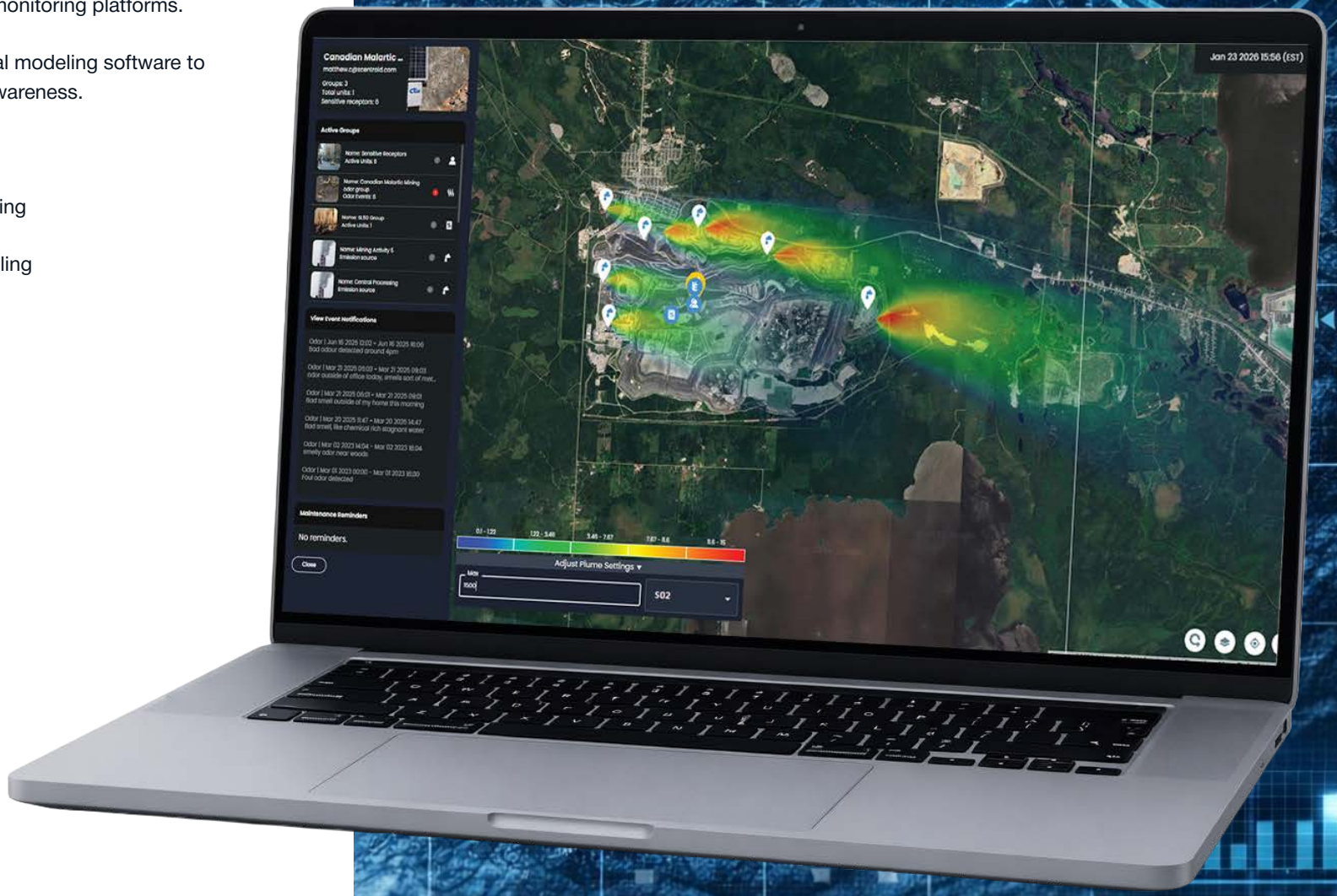
Environmental Intelligence and Data Integration

Sentry provides continuous environmental monitoring with real-time data transmission to centralized monitoring platforms.

Sensors are integrated with environmental modeling software to support plume analysis and situational awareness.

Key capabilities include:

- Real-time gas concentration monitoring
- Automated alarm thresholds
- Plume tracking and dispersion modeling
- Geospatial data mapping
- Historical data analysis
- Remote monitoring and reporting



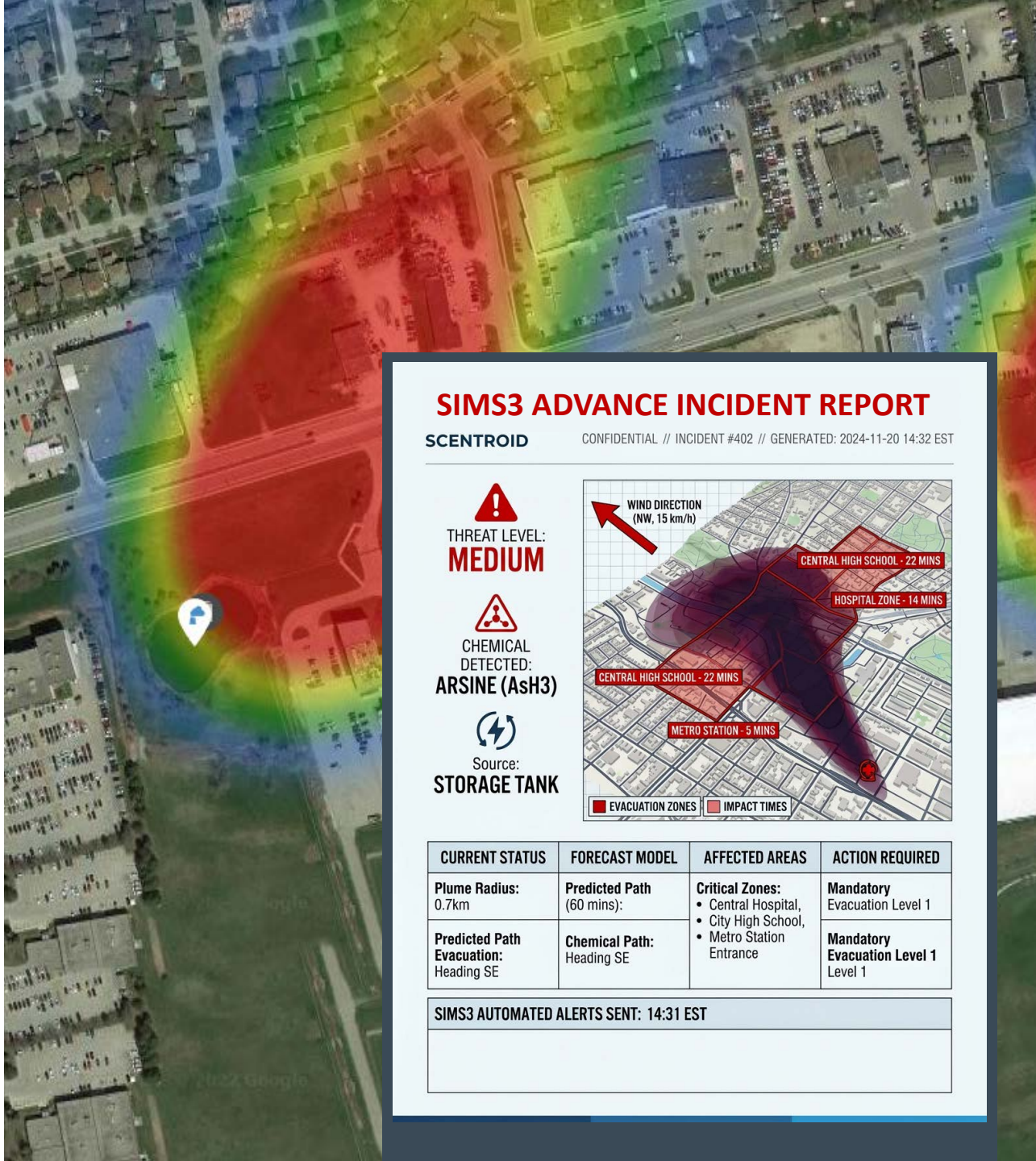
SIMS3: AI Driven Predictive Intelligence

Advanced Dispersion Modeling: Integrates real-time local weather data (wind speed, direction, temperature) with TR9+ readings to generate accurate plume models instantly.

Predictive Forecasting: fast-forward the model to see the predicted path of the toxic cloud over the next hour. Changes response from reactive to proactive so that areas can be evacuated before the gas arrives.

Automated Alarms & Dynamic Geo-Fencing: If the predictive model indicates the plume will cross into a defined critical zone (e.g., a school or subway entrance), SIMS3 automatically triggers pre-set alarm protocols to field units.

Instant Flash Reports Generation: Upon a critical detection event, SIMS3 instantly compiles data into a standardized Flash Report. SIMS3 AI summarizes chemical type, plume trajectory, and at-risk sectors for immediate distribution to high-level stakeholders without manual effort.



Specifications

Category	Specification
Enclosure	Military-grade ruggedized composite case (crush-resistant, shock-proof).
Dimensions (Estimated)	350 mm x 300 mm x 150 mm (13.7” x 11.8” x 5.9”)
Weight	3.5 kg (Responder) / 4.8 kg (Defender), including TPD and Gamma modules)
Ingress Protection	IP67 (Case closed)
Operating Temperature	-40°C to +50°C (-40°F to 122°F)
Operating Humidity	5% to 95% Non-condensing (Active filtration available for high-humidity/water-spray environments).
Mounting Options	Man Portable (Shoulder strap/backpack), Vehicle-Mounted (Quick-Release), Stationary (Tripod/Wall mount)
Internal Battery	High-capacity, hot-swappable Lithium-Ion.
Runtime (Responder)	12+ hours continuous monitoring.
Runtime (Defender)	8+ hours (Dependent on frequency of Thermal Fractionation flash-heating cycles).
External Power	12V-24V DC input for continuous vehicle power.
Auxiliary Power	Compatible with Scentroid rapid-deploy solar chargers for unattended perimeter sentry mode.
Local Interface	Bluetooth 5.0/LoRa connection to Ruggedized Operator Tablet. Provides range up to 10km
Remote Transmission	Built-in Secure 4G/LTE cellular modem and Wi-Fi.
Central Command	Streams live encrypted telemetry, GPS, and sensor data to the SIMS3 Cloud Platform for swarm mapping and plume modeling.
Onboard Storage	32GB solid-state memory (Stores >5 years of continuous sensor logs).
Technology	Thermal Fractionation (Micro-Trap and 10.6 eV PID).
Heating Profile	Low Thermal Mass (LTM) heater. 30°C to 300°C in < 5 seconds (<1°C precision control).
Sample Phase	50 – 150 mL/min
Dry Purge	50 mL/min
Desorb/Analyze Phase	10 – 20 mL/min (Concentrated agent injection)
Sensitivity	Parts-Per-Trillion (PPT). 1000x enrichment factor.
Target Agent: Nerve	(G/V Series) Sarin (GB), Soman (GD), Tabun (GA), VX.
Target Agent: Blister	(Vesicants) Mustard Gas (HD), Lewisite.
False Alarm Mitigation:	Multi-phase thermal stripping isolates heavy CWAs from light combustion background noise (Diesel, Kerosene, Plastics).

Sensor Specifications

Sensor Technology	Target Gas	Hazard	Detection Threshold	Range (Post-Attack Spec)	Resolution
PID (10.6 eV)	Broadband VOCs / Jet Fuel / Agents	General Safety	1 ppb	0 – 5,000 ppm	10 ppb
Electro-Polymer	Arsine (AsH3)	Blood / Semiconductor	0.02 ppm	0 – 10 ppm	0.05 ppm
Electrochemical	Hydrogen Cyanide (HCN)	Blood	0.1 ppm	0 – 100 ppm	0.5 ppm
Electrochemical	Phosgene (COCl2)	Choking	7 ppb	0 – 10 ppm	0.01 ppm
Electrochemical	Chlorine (Cl2)	Choking	0.05 ppm	0 – 200 ppm	0.1 ppm
Electrochemical	Hydrogen Fluoride (HF)	Acid	2 ppb	0 – 20 ppm	0.1 ppm
Electrochemical	Ammonia (NH3)	Corrosive	0.005 ppm	0 – 1,000 ppm	1 ppm
Electro-Polymer	Hydrogen Sulfide (H2S)	Lethal	0.01 ppm	0 – 500 ppm	0.1 ppm
Electro-Polymer	Sulfur Dioxide (SO2)	Combustion	0.01 ppm	0 – 200 ppm	0.1 ppm
Electrochemical	Hydrogen Chloride (HCl)	Acid	0.5 ppm	0 – 100 ppm	0.1 ppm
Electro-Polymer	Nitrogen Dioxide (NO2)	Combustion	0.005 ppm	0 – 50 ppm	0.1 ppm
Electro-Polymer	Carbon Monoxide (CO)	Fire Safety	0.01 ppm	0 – 2,000 ppm	1 ppm
Electrochemical	Oxygen (O2)	Asphyxiation	0.01% vol	0 – 30% Vol	0.1%
Catalytic / NDIR	LEL	Combustibles / Methane	100 ppm	0 – 100% LEL	1% LEL
NDIR	Carbon Dioxide (CO2)	Fire Safety	1 ppm	0 – 5% Vol	0.01%
Laser Particulate	PM1, PM2.5, PM10	Smoke/Soot	1 µg/m³	0 – 10,000 µg/m³	1 µg/m³
Scintillator	Gamma Radiation (Scentinel Only)	Radiation	0.01 mR/h	0 – 100 mR/h	0.01 mR/h
Thermal Fractination - PID	Mustard Gas (HD)	Blister Agent	5 ppt (0.005 ppb)	5 ppt – 5,000 ppb	1 ppt
Thermal Fractination - PID	VX	Nerve Agent	10 ppt (0.010 ppb)	10 ppt – 2,000 ppb	5 ppt
Thermal Fractination - PID	Sarin (GB)	Nerve Agent	50 ppt (0.050 ppb)	50 ppt – 5,000 ppb	10 ppt
Thermal Fractination - PID	Soman (GD)	Nerve Agent	50 ppt (0.050 ppb)	50 ppt – 5,000 ppb	10 ppt

Know the Air.
Respond Faster.

Understanding airborne hazards is critical to protecting personnel, infrastructure, and surrounding communities.

Sentry provides comprehensive monitoring capabilities designed for the detection of chemical threats and industrial hazards in demanding operational environments.

For more information:

Scentroid
Air Monitoring & Environmental Intelligence Systems
www.scentroid.com
info@scentroid.com

70 Innovator Avenue, unit 7
Stouffville, ON, L4A 0Y2

416-479-0078
1-888-988-IDES (4337)

info@scentroid.com
www.scentroid.com

SCENTROID
Future of Sensory Technology