



Rethinking mining **automation:** Edge Intelligent Control for Operational Excellence

CYBARETE
MINING SOLUTIONS



**METAL
MANAGEMENT
SOLUTIONS**

A banner for the 4th Digital Transformation in Mining Conference 2025. The banner features a blue and white color scheme with various icons representing digital technologies like IoT, AI, and data analytics. The text includes the conference title, dates (25-26 June 2025), location (Glenburn Lodge and Spa, Muldersdrift), and a note about ECTS Validated CPD Activity.

dtm.
4TH DIGITAL TRANSFORMATION
IN MINING CONFERENCE 2025
Putting digital technologies to work

25-26 JUNE 2025
GLENBURN LODGE AND SPA,
MULDRSDRIFT

SAIMM 130
130 YEARS OF TECHNICAL EXCELLENCE

ECSA Validated CPD Activity. Credits = 0.1 points per hour attended.

What is MineZone?

MineZone is a control system built on the BASE industrial automation engine specifically for mining operations. It represents a departure from traditional automation approaches, emphasizing scalability, OEM interoperability, and the integration of humans and machines.

The BASE industrial automation engine is the foundational technology for MineZone, invented by Dr. Dale Sparrow and refined through the academic partnership of Stellenbosch University's Mechatronic Engineering Department and the Mandela Mining Precinct's RTIMS programme.



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Brief Profiles



First-Principles Innovation

The inventors of the core automation engine. Cybarete delivers groundbreaking, first-principles innovation using established, mine-hardened hardware to solve the industry's toughest challenges.



Proven Digital Transformation Partners

11 years in business, digitalisation partners to some of the world's largest metal value chains. Framework providers for digital transformation success (Project Management, Solution Design, Change Management, Support)

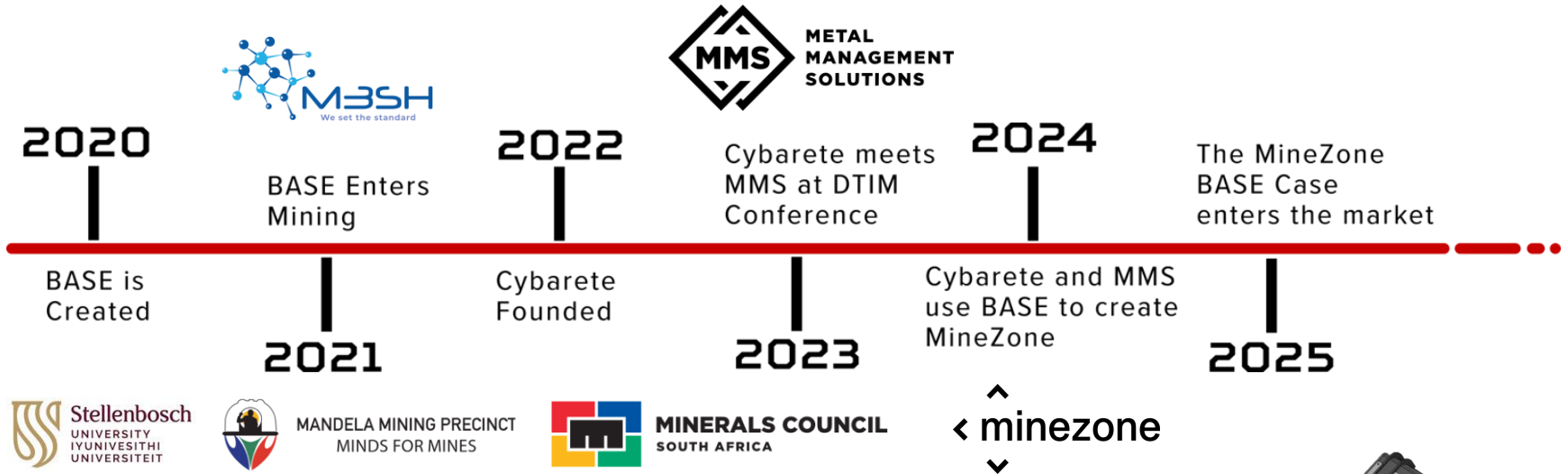


Mining Expertise

Dayenu have expertise in mine planning and engineering, continuous improvement, project management, consulting and on-site execution and change management.



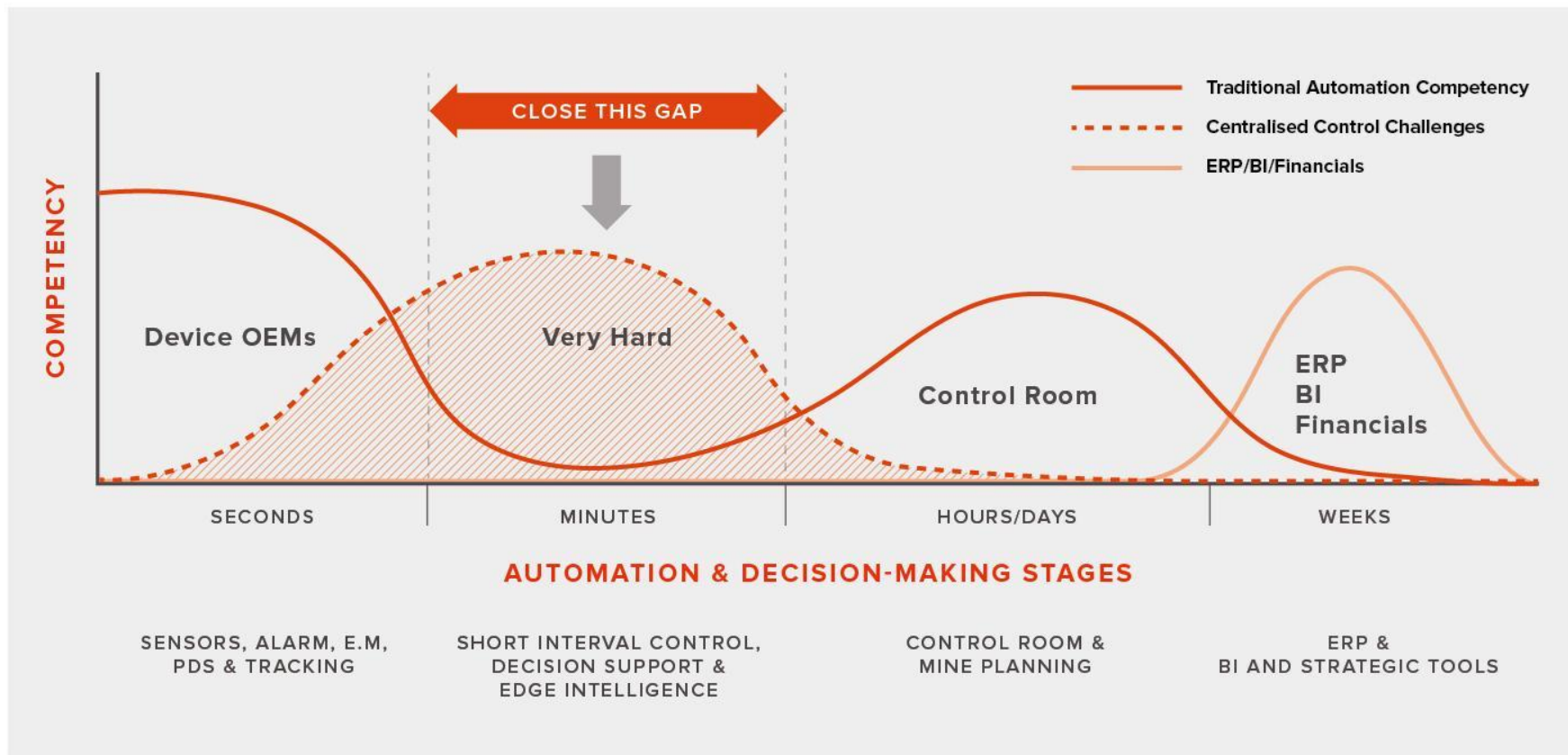
The MineZone Origin Story



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Why MineZone?: The Critical Gap [^]minezone _∨



The Vision Statement



To unify every person and asset on a single, resilient platform that supports autonomous short interval control, situational awareness and predictive intelligence directly at the operational edge.

- **Achieve On-Site Agility:** Empower teams and resources with decentralized, real-time operational control.
- **Slash Downtime:** Ensure resilience with networks that work, even without power or traditional networks.
- **Unify Your Entire Operation:** Connect all assets and people into a single, self-organising system.
- **Shift from Reactive to Proactive:** Use predictive data to enhance safety, optimize assets, and automate compliance.



What makes MineZone Unique?



- **Edge Intelligence and Control:** control room independent: MineZone embeds intelligence directly at the point of operation
- **Network Independence and Resilience:** MineZone establishes its own self-organizing communication network
- **OEM-Agnostic Interoperability and Integration:** OEM interoperability without costly infrastructure overhauls, leveraging IT & OT convergence for immediate value.
- **Human-Centric Design and True Short Interval Control (SIC):** MineZone can dynamically manage shifts, enhance resource allocation, and improve safety operations

**Agile,
Intelligent,
Resilient,
Human-centric.**

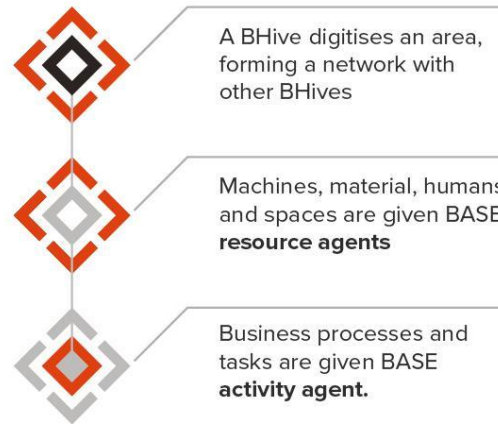


The BASE agent automation engine



BASE resources are **drawn to** and linked by the **activities** that need them.

A **fractal control hierarchy** is formed by activities and sub-activities



Powered by  **BASE**

Three Basic MineZone agents



POSTMAN

Deliver data from disconnected areas.

Eliminate data gaps from unreliable connections

Mobile, re-deployable. digital infrastructure.

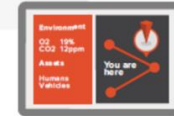
Vendor neutral platform



ZONEVIEW

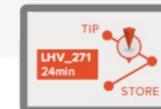
Real-Time Local Situational Awareness

Environmental Data
Production Data
Occupancy and Vehicles



ZONETRACK

Occupancy, exposure and last seen locations. People and equipment

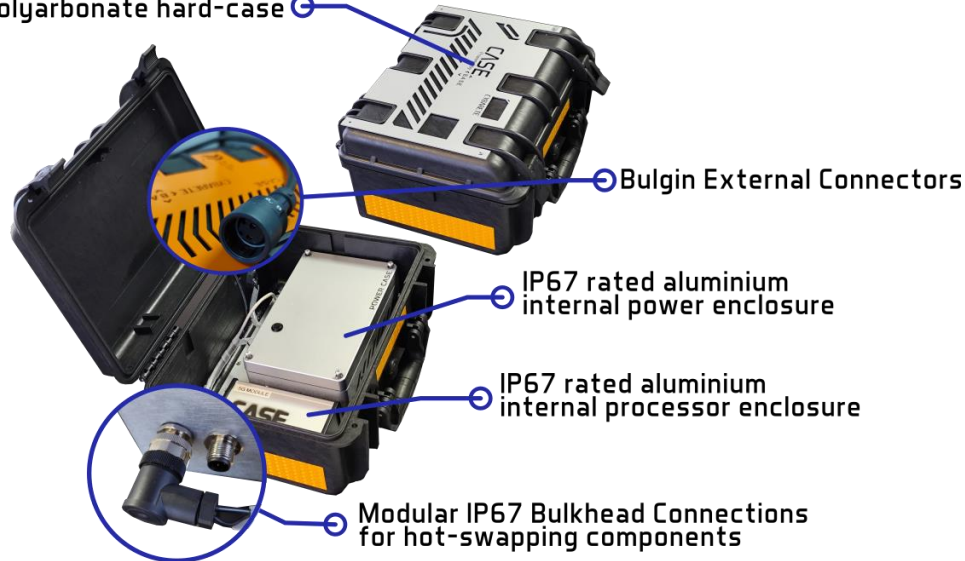


Resilient Hardware



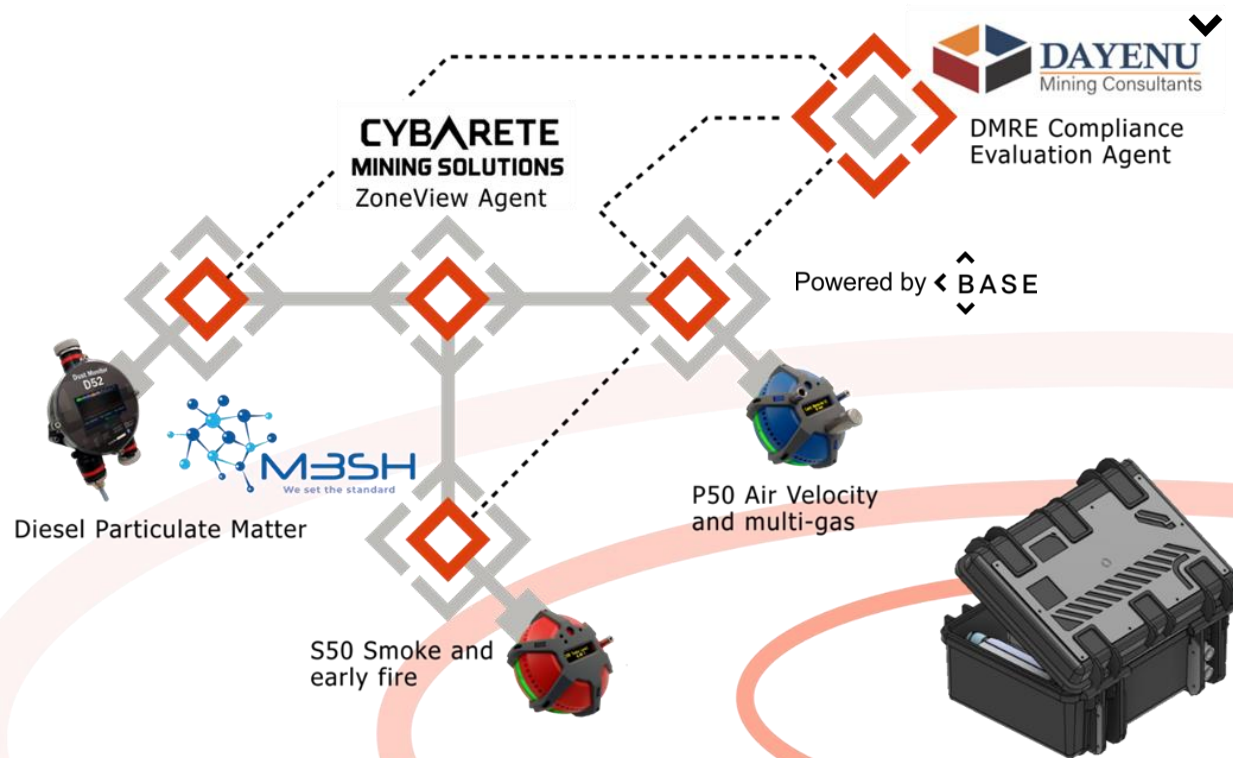
Easy to Deploy, Built to survive.

IP67 30% Glass re-inforced
polycarbonate hard-case



Live Demonstration

^
< minezone
v



Thank you

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Technology | Advisory | Services



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APPENDIX

Technology | Advisory | Services

ZONE ID: TestZone

The current status of this workplace area.

Start Date: 6/23/2025

Start Time: 1:41:56 PM

Alerts: undefined

1:42:06 PM

Mon Jun 23 2025

Notification Panel

View important notifications related to this zone.

There are currently no notifications

[Post Notification](#)

Ambient Sensing

The current ambient conditions in this zone. Touch to see historic readings.

TEMPERATURE 22 °C



CARBON MONOXIDE 1 PPM



HUMIDITY 65 %



TEMPERATURE 22 °C



CARBON MONOXIDE 1 PPM



HUMIDITY 65 %



Traffic Summary

Current traffic status and throughput in this zone. Touch to see detailed traffic information.

PEDESTRIAN TRAFFIC



PRESENT: 0

THROUGHPUT: 0

VEHICLE TRAFFIC



PRESENT: 0

THROUGHPUT: 0

Traffic Overview

Zone: TestZone

12-hours

24-hours

48-hours

Pedestrian Traffic

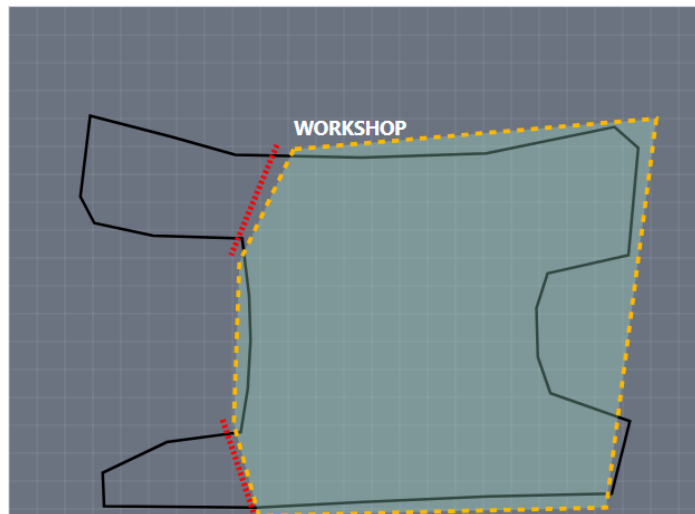
Currently Present **0**

Total Throughput **0**

Vehicle Traffic

Currently Present **0**

Total Throughput **0**

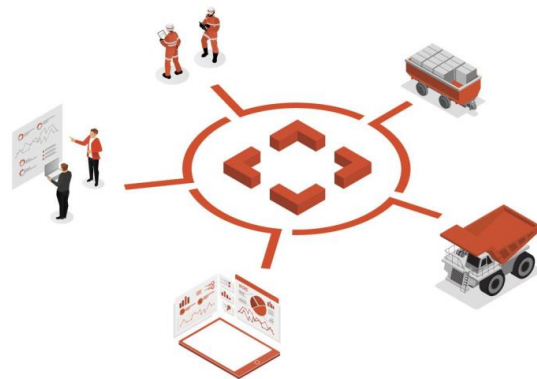


What is BASE?

Powered by  BASE

BASE is the industrial automation engine invented by Cybarete. It is an agent-based distributed intelligence architecture - **on which MineZone is built**. It allows resources and personnel in an area to self-organize around tasks and provide situational awareness among workers, sensors, and equipment, **independent of traditional IoT networks**.

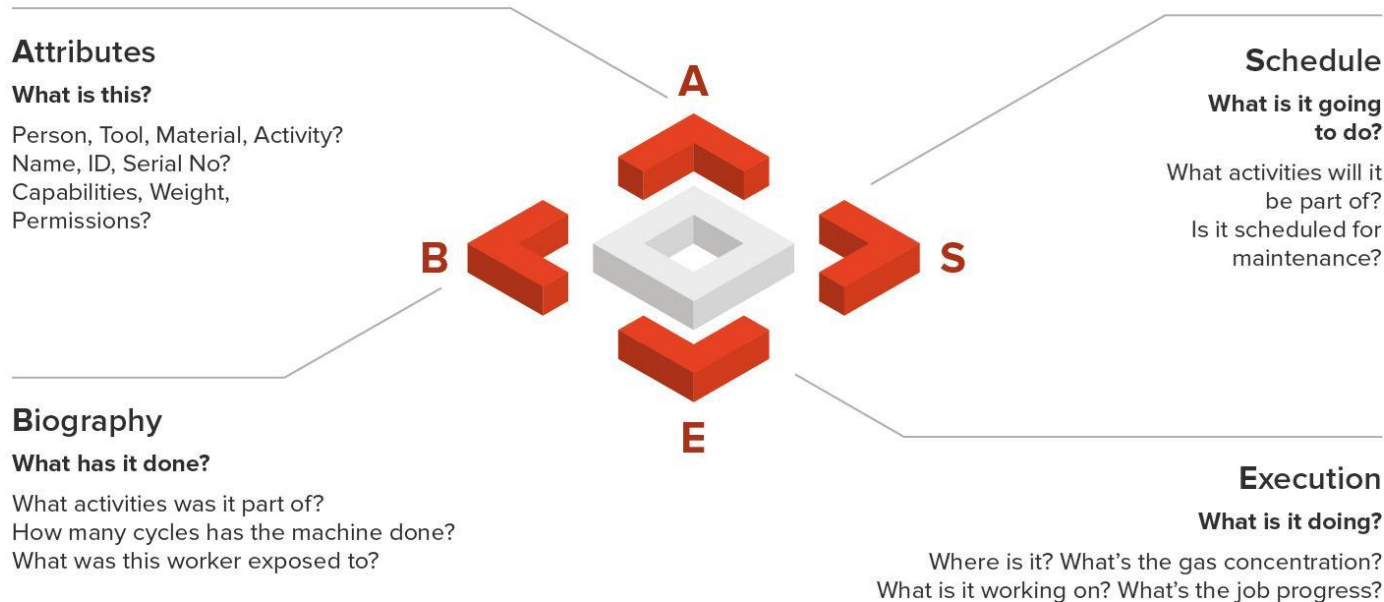
Its common interoperable communication framework can bring multi-tenant environments alive to enable short interval control over production and safety operations.



Inside a BASE Agent

Powered by  BASE

BASE separates future,
present and past data.



What is MineZone(2)?



- A platform built on BASE, our distributed agent-based industrial automation engine tailored specifically for mining.
- Enables rapid development of custom agents for client-specific challenges.
- Powerful systems integration tool to leverage existing infrastructure and easily adopt new technologies, elevate legacy systems and future proof your operations.
- Unlock new levels of safety, optimisation, and in-field decision making with your existing systems.
- Effective Operational Technology and Information Technology Bridge.

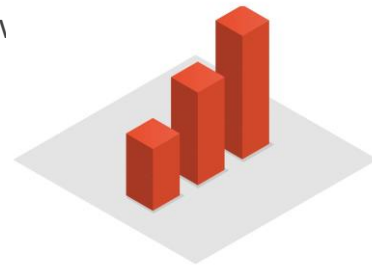


Problems MineZone Solves



- The **chasm between OT and IT has huge opportunity cost in mining**

- Reliance on centralized control leading to vulnerabilities and extended downtime.
- Limited scalability and lack of critical local functions.
- Difficulties in achieving real-time, actionable intelligence.
- Struggles with OEM interoperability and system integration.
- Data velocity gap for short interval control and local intelligence.
- Challenges in safety, situational awareness, and response to events.
- Difficulties in managing occupational hygiene overexposures.



- In the market and operating environment, **productivity improvement is urgent**

- Operational inefficiencies, delayed responses to events, and lack of situational awareness at the work face lead to lost productivity and increased risk.

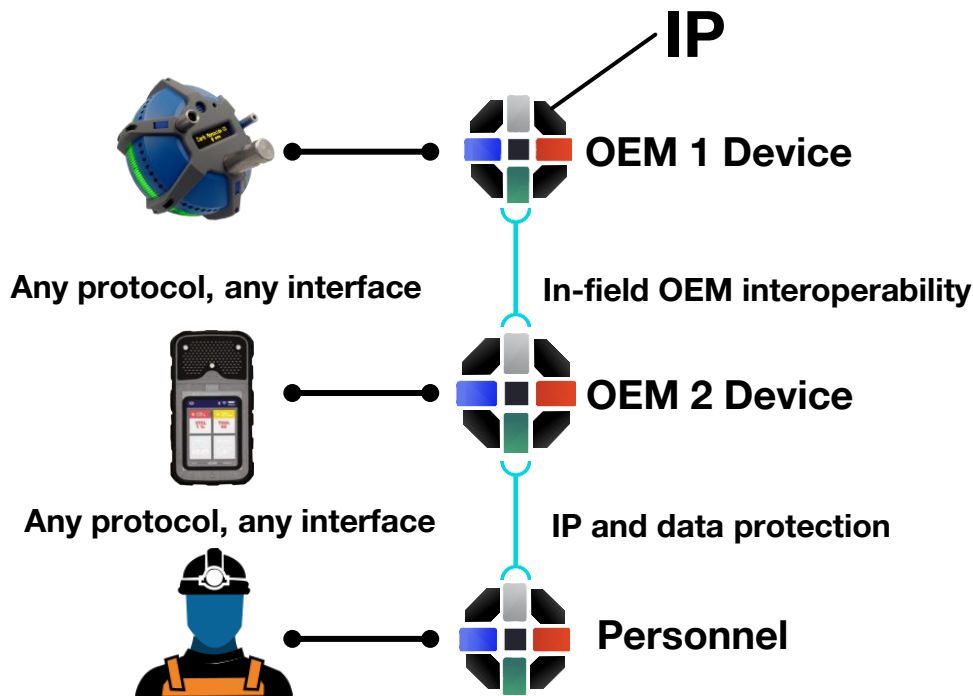
OEM Interoperability



Vendor Neutral In-Field interoperability

Plugins enable highly custom **software augmentation.**

Plugins **encapsulate your IP** during interoperation.



Testimonials

“We see this becoming an industry standard, it has enormous potential to solve a lot of our problems.”

Jean Jacques Verhaegen
RTIMS program of Mandela Mining Precinct

“I see this technology having an enormous potential and giving us a first mover advantage”

Mark Steven,
Schauenburg Systems



Our clients are seeking to enhance their digital, short-interval control, and data intelligence capabilities with our devices. A local, in-field software augmentation is needed for which we believe MineZone is an ideal solution ”

Andre Jansen van Rensburg
CEO, M3SH