Tracking + Measuring + Control + Operation Management **= Operative Strategy**

smartflow®

2024 *General Brochure*

Smartflow® has the vision of being the main manager for the implementation of the **Digital Mine.**

Smartflow®, system that integrates cutting-edge technological solutions, based on the identification of all the operational flow that exists in areas of interest in real time, integrating the monitoring of communication networks and signals from sensors to achieve the concentration of information in a single system, contributing to the continuous improvement of production processes and increasing security levels, making it a manager for sustainable development.

Real Time Monitoring   **Alarms**   **Records**

System Benefits.

3D web monitoring and control software that increases security levels and productivity, digitizing the movements of operational personnel, measuring the conditions and parameters to improve management operational control and a more complete operational strategy.

Architecture of Smartflow® System

Software   Passive reader   Active Smart Tag   Conectivity   System integration
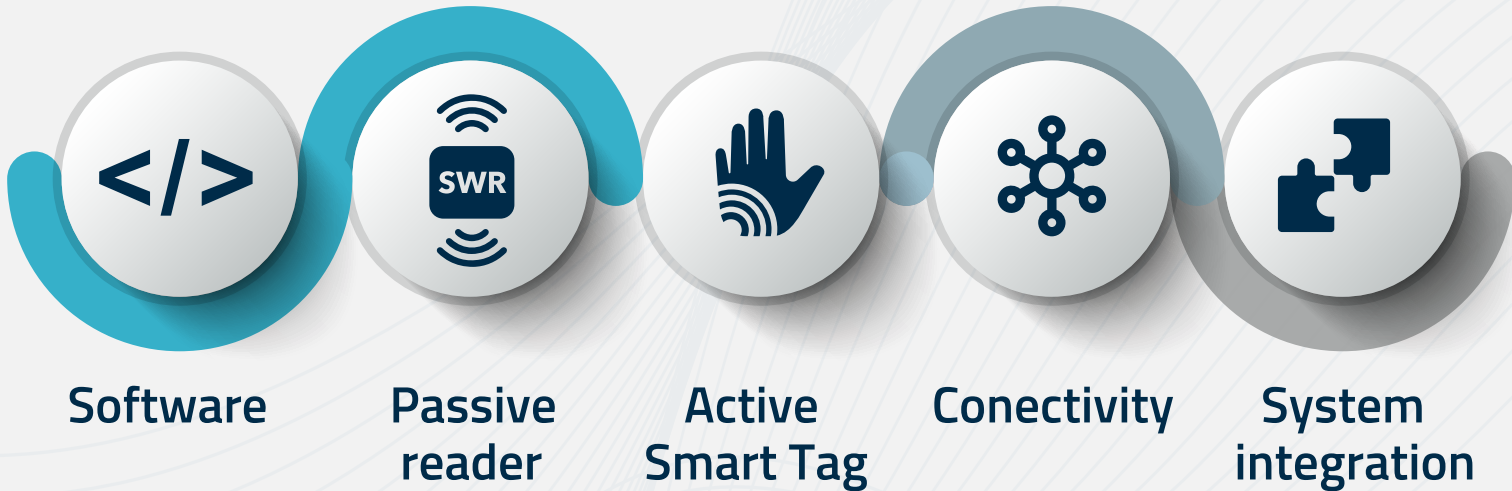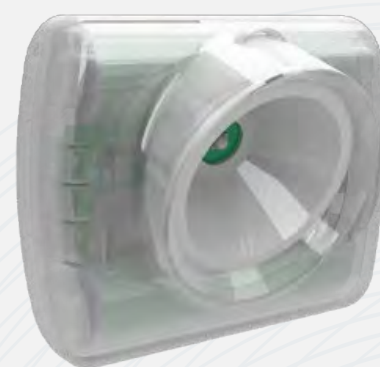
These elements allow the robustness and flexibility of the system, obtaining with this the possibility of integrating it with any other module for the benefit of the process.

Development Road Map: ☑ Ready   ☐ In Development

Tracking	Measurement		Control	Operation Management	Operative Strategy
☑ Surface	☑ LAIoT®	☐ Fatigue	☑ Hauling	☐ Resources Administration	☐ Business Strategy
☑ Inside Mine 3d Viewer	☑ Leaky Feeder	☑ Telemetry	☐ Pumping	☐ Operation Planning	☐ Predictive Analysis
☑ Collision Awareness	☑ Gases	☐ Vital Signs	☑ Ventilation	☐ Operations	☐ Performance Management
☑ Dispatch Center	☑ Energy	☑ Liquids	☐ Substations	☐ Maintenance	
			☐ Traffic Lights	☐ Reports	

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Tracking Module Equipment

Device for monitoring
SmartLamp 2.1

- Wi-Fi open security mode, WEB, WPA y WPA2-PSK / 802.11 b/g/n
- Blue flashing LED for working status
- On / Off button, acknowledgment and emergency
- WiFi 2.4 and 5 GHz / BLE 4.2 Connectivity
- 7,500 lux
- 10,000 lux
- IP68 certification

Device for monitoring
Vehicle SmartTag WiFi V3.0

- IoT device / Industry 4.0
- Vehicle location
- Ergonomic, easy to install
- Use multipurpose WiFi networks
- Over current protection
- Communication 2.4 GHz WiFi standard 802.11 b/g/n and BLE 4.2
- Open WiFi security mode, WEB, WPA and WPA2-PSK
- LED working status indicator

Monitoring device
Dispatch Center

- Dynamic and Static Assignment of SmartLamp and PPE
- Personalized registration of equipment and accessories
- Entry/Exit History
- Digital photograph when registering in the database
- Communication (modules) Smartflow® system
- Historicals of SmartLamps, Accesories, and Personal Protection Equipment (PPE) assignment

Device for electrical charging
Multicharger

- 204-port multicharger for SmartLamp WiFi Versión 2.0

Communication device
External Reader 1.0

- Compatibility with SmartLamp, Smart Vehicle tag for Collision Awareness System and Smart Flare.

Communication device
SmartBeacon

- Compatibility with SmartLamp, Smart Vehicle tag for Collision Awareness System and Smart Flare.
- Allows tracking and monitoring of personnel inside the mine.
- Bluetooth 5.0 Low Energy.
- Detection range from 30 to 200 Meters.

Communication device
LA-SR01

- DMR Duplex Radio
- Android 10.0
- SGS IP68 certification
- Double microphone with noise cancellation

Communication device
RG360

- SGS IP68 certification
- Android 10.0
- Wi-Fi® 2.4GHz y 5GHz
- Bluetooth® 4.2

Communication device
LA-SR02

- NFC function
- Android 13
- Large RAM capacity
- 8500 mAh battery
- Fast charging function

Communication device
LA-ST01

- Full compatibility with the 5G network
- Android 13
- Large internal memory
- Has fast charging function
- Large expandable internal memory
- IP68 Rated, MIL-STD-810H
- 249.1 x 167.8 x 19.8 mm

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Location and Tracking Module in Surface and Inside Mine:

The **Location and Tracking Module** is the base system of **Smartflow®**. In it we can find our 3D Viewer which displays, in a virtual model of the mine, the location of personnel and vehicles in real time during their activities.

Its intelligent interface allows you to navigate through the different areas of the mine. Intuitive and friendly way, generating a highly effective monitoring experience for greater safety of active personnel.

BENEFITS:

- Location and counting of personnel/vehicles inside the mine.
- Total evacuation, by zones or personalized.
- Sending bi-directional alert notifications in real time (Help, evacuation and Man Down).
- Historical traceability record.
- Customized historical reports.
- Performance dashboards by time spent on sites.
- Web monitoring for multiple users.
- Access control.

Other Benefits:

- Permissions management according to user role.
- Graphic visualization of elements for different Smartflow® modules.

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Underground: 6 Surface: 0
Underground: 1 Surface: 0

Location and counting of personnel/vehicles inside mine.

Historical traceability record.

Device and equipment assignation trough the dispatch center.

Web monitoring for multiple users.

Bi-directional alarm notifications in real time

Man down

General Evacuation, by zone or custom

SOS

Help

Access control.

LOCALIZATION AND TRACKING ON SURFACE AND UNDERGOUND

Performance dashboards for on-site permanency time.

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Tracking + Measuring + Control + Operation Management **= Operative Strategy**

Monitoring center
Surveillance and inspection

Ventilation doors

4G / 5G LTE

Collision
Awareness

Location

Gas
Detection

Air quality

Energy
Substations / Power Centers

Security and
personnel
location

Telemetry

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WiFi
Bluetooth

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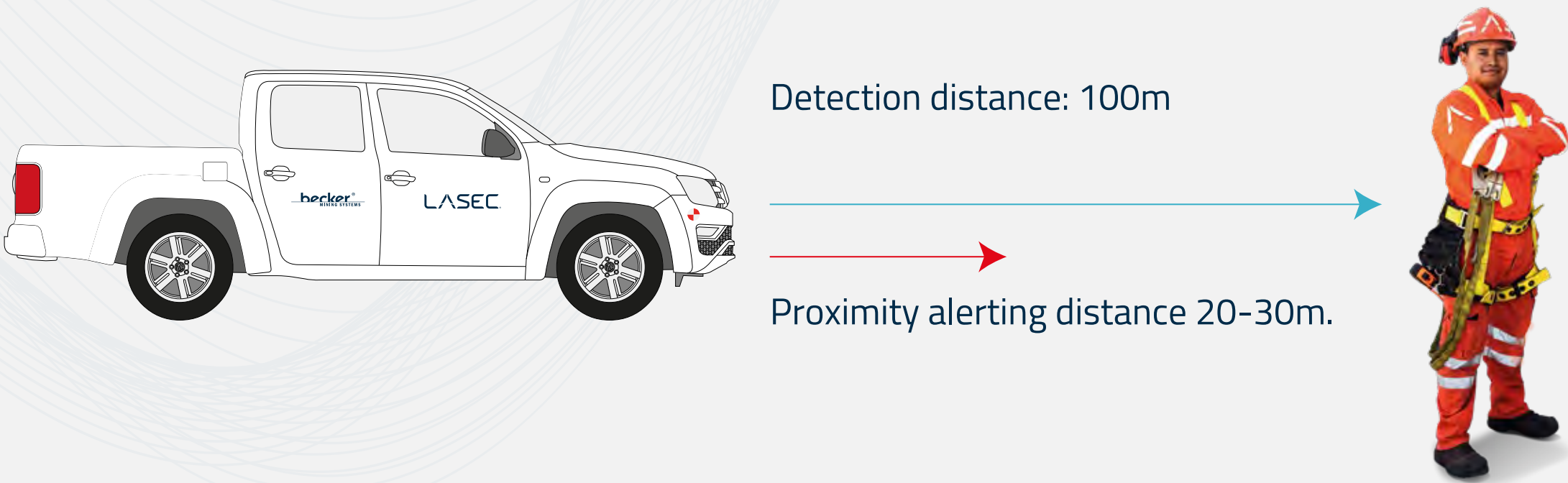
Collision Awareness Module:

LASEC Technology Systems has developed its own **Proximity Alert System** using a combination of Wi-Fi technology (tracking and location of vehicles and people in real time) and Bluetooth (detection and recognition between vehicles and pedestrians approaching your position), directly integrated into light and heavy vehicles through the **Vehicle Tag 3.0** that has the ability to detect personnel and vehicles at a range of 100 meters and alert at a radial distance of 30 meters (configurable) to Prevent collisions inside and on the surface of the mine.

BENEFITS:

- Visual and auditory warning to the operator.
- Identification screen for counting vehicles and pedestrians.
- Identification of risk areas through beacons.
- Works on surface and underground
- Stand Alone proximity warning system, does not require connection to server can operate independently.
- Automatic synchronization with servers when returning to Wi-Fi network coverage.

Vehicle Tag 3.0

Bluetooth reader 1.0

30m Alerting

100m Detection

*Illustrative image. The dimensions may vary. Detection and Alerting distances are configurable.

Detection distance: 100m

Proximity alerting distance 20-30m.

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Operating structure

Monitoring Center

Events information in smartflow

LAN Network

Link

SmartLamp
The employee carries a SmartLamp with bluetooth which allows it to be displayed by the system.

Smart Reader
Prevention System Accessory from the Smartflow Collision awareness system.
Used to detect proximity and send the information to the Vehicle Tag via a Bluetooth link.

Vehicle Tag
Sends notifications in real time about the proximity detections of pedestrian and vehicles and risk areas.

Beacon
Bluetooth device configurable that constantly sends location data for tracking strategic points of the mine.

SmartLamp

Detection Alert

| EMPLOYEE | HEAVY VEHICLES | UTILITY EQUIPMENT | RESTRICTED AREA |

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Dispatch Center:

With **Smartflow®** and **Dispatch Center** you have control of assignments SmartLamps customization and management of accessories, tools and work equipment allowing an improvement in inventory control.

BENEFITS:

- User identification through employee number or RFID card
- Dynamic and Static Assignment of SmartLamp and PPE.
- Inventory asignation and records of equipment, accessories, and PPE with RFID.
- Synchronization with Smartflow® server.
- Image and general user data.
- SmartLamp Minimum Battery Level Validation.
- Entry/Exit Historicals.
- Historicals of allocation of equipment, accessories and personal protective equipment.
- Notification of undelivered equipment.
- Generation of record for lost or damaged equipment.

ASSIGNMENT

NÚMERO DE EMPLEADO
COMPAÑÍA
DEPARTAMENTO
BATERÍA
NÚMERO DE SERIE
POSICIÓN
Rfid

TU SEGURIDAD SIEMPRE PRIMERO

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LAIoT® Network Monitoring Module:

LAIoT® offers quick and robust connectivity technology that allows to bring instant connection via fiber optic segments and connectorized nodes that guarantee high bandwidth for technologies such as WiFi and LTE enabling to achieve digitalization of our points of interest.

With **Smartflow´s LAIoT Network Monitoring module,** we keep track of the health of the communication network, having the status of the fiber optic links and the performance in general of the Network, with information like: broken links and where they had occur, use of the switches proccessor and memory and information related to connected devices like CCTV cameras or WiFi Access Point among others.

BENEFITS:

LAIoT® was developed to provide robust and stable connectivity for an industrial communication system, featuring technology that allows up to 144 optical fibers per node to facilitate connectivity topologies like redundant stars, connections, etc.

LAIoT SFO
Connectorized Optical Fiber Segments

Connectorized Optical Fiber Reel 12-24-48.

Hermaphrodite connector for joining reels

MPO Connector for high-density optical fiber

LAIoT NT — Trunk **Node**

LAIoT NC — Connectorized **Node**

LAIoT NS — Splitter **Node**

LAIoT NE — Energy **Node**

Key Features

- High availability
- Easy installation
- Scalability
- Mobility
- Connectivity redundancy
- Electrical redundancy
- Electrical power quality

LAIoT® Product Family

SFO= Connectorized Optical Fiber Segments
NT= Trunk Node
NC= Connectorized Node
NS= Splitter Node
NE= Energy Node
MESF= **Smartflow® State Monitoring** Software

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Leaky Feeder Monitoring Module:

The **Smartflow® Leaky Feeder Monitoring Module** aims to make maintenance of Varis brand Leaky Feeder Networks more predictive and interactive by displaying the network on a single-line diagram in a 3D web interface. This enables immediate fault localization, identification of attenuation levels, voltage per amplifier, allowing for targeted correction. This tool is indispensable for timely Leaky Feeder Network maintenance.

BENEFITS:

- 3D Web Monitoring of Varis® brand Leaky Feeder Network.
- Online single-line diagram.
- Alerts for high or low attenuation in amplifier devices.
- Alerts for high or low voltage in amplifier devices.
- Preventive maintenance.
- Immediate fault identification.
- Online Network Information.
- Event notification with Smartflow® Alarm Module.
- Distance measurement for maintenance or new developments.
- Real inventory of different Leaky Feeder System components.

VISOR3D®
by **smartflow®**

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Energy Monitoring Module:

Smartflow® Energy Monitoring Module is a real-time electrical energy consumption analysis system. It visualizes the current state of substations on a 3D platform, indicating alarms or generating a historical energy consumption record leading to an operational strategy to avoid unnecessary resource consumption.

BENEFITS:

- Electrical energy savings
- Monitoring of the entire interior mine and surface electrical network
- Automatic generation of electrical network single-line diagram
- Critical measurement report generation
- Billing report based on energy costs, general or by area
- Visual notifications for out-of-range measurements
- Enables timely operational and maintenance actions
- Access control to substations via intrusion sensors
- Multibrand system allowing monitoring of any device
- Prevents unexpected shutdowns and equipment damage due to overloads

- Preventive Maintenance
- Immediate Fault Identification
- Online Network Information
- Event Notification with SmartFlow®

* Ambient Temperature.
* Humidity.

Line Voltage

Overload Relay:
Open / Closed State

Vacuum Switch:
Open / Closed State

BT Derivatives:
* Main BT Status
* Total BT Load
* Individual BT Derivative Status
* Secondary Voltage Level
* Load Level per derivative

Transformer:
* Operating Temperature

Real Time Monitoring   **Alarms**   **Records**

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Telemetry Module:

The **Telemetry Module** collects, compares, and communicates vital equipment information. It is available for all mining and construction equipment, both surface and underground.

BENEFITS:

- Online equipment condition monitoring and quick response to rectify or prevent issues.
- Identify equipment missuse or training needs.
- Improve predictive maintenance planning with condition monitoring.
- Understand equipment usage and enhance productivity.
- Simplified productivity analysis.
- Easy description of vital equipment data.
- Maximized uptime.
- Identify operators needing training.
- Enhanced operator performance.
- Safer and more efficient work environment.

Mobile Node

Mobile Node

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Smartflow® with the vision to be the primary facilitator
in achieving the implementation of a **Digital Mine.**

Road Map · Telemetry Module in Development: ✓ Ready ☐ In Development

☐ **Hydraulic:**
- Temperature
- Pressure Level
- Oil Pressure
- Oil Contamination

☐ **Transmission:**
- Temperature
- Pressure
- Gears (R, N, 1st, etc.)

☐ **Arms:**
- Percussion Pressure
- Rotation Pressure
- Forward Pressure
- PWater Pressure

✓ **Engine:**
- Diagnostic Trouble Code
- Distance
- Temperature
- Coolant
- Particle Exhaust
- Hour Meter
- Presure
- Fuel Level

✓ **Cabin:**
- Operator ID
- Check List
- Emergency Switch
- Acceleration Pedal
- Service Brake
- Speed

☐ **Axles and Brakes:**
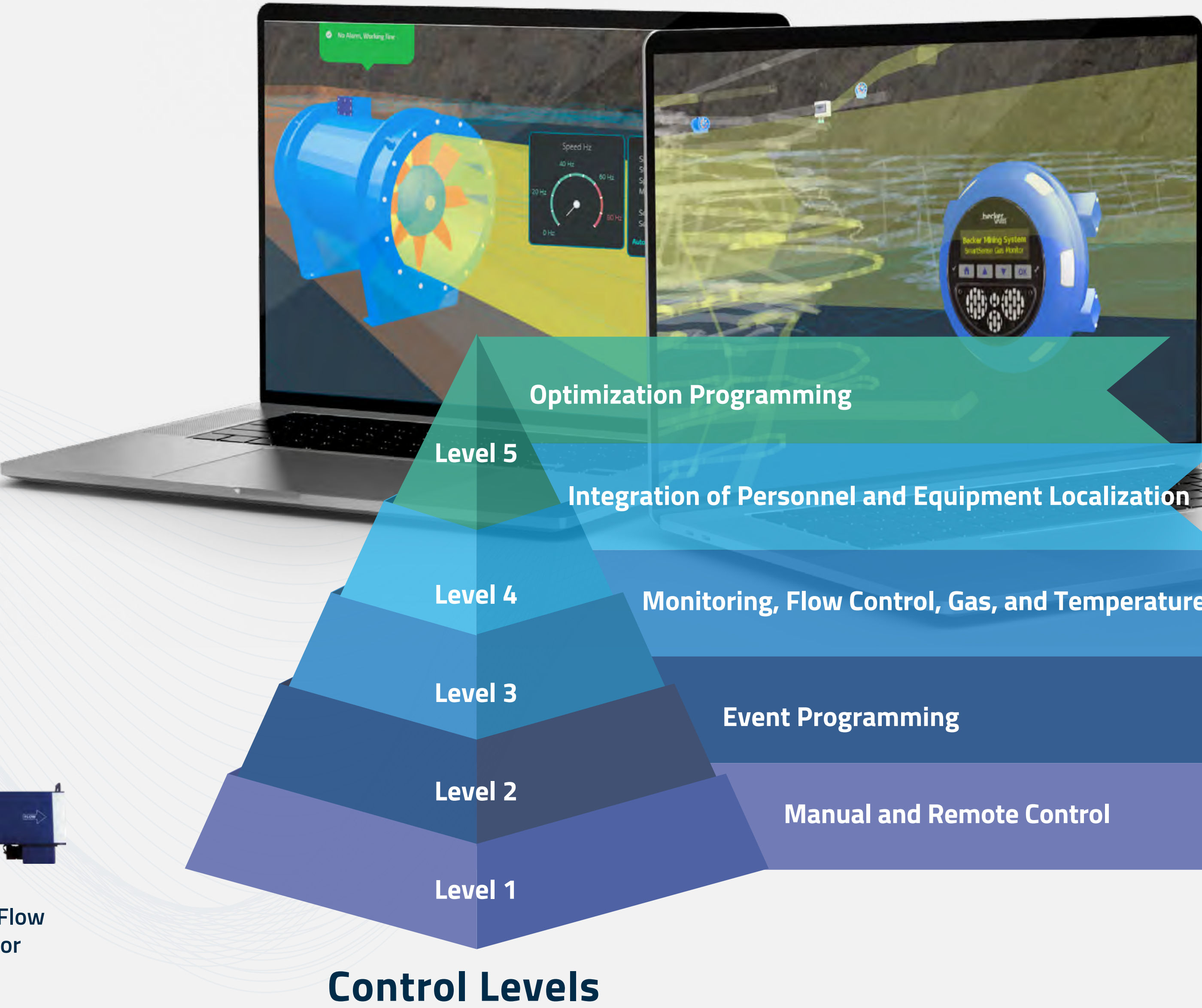- Temperature
- Pressure

☐ **Tires:**
- Temperature
- Presure

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Ventilation Module:

Smartflow® Ventilation Module supports the management of mining ventilation systems. Through its 3D Viewer, it allows real-time observation of general and specific conditions of main and secondary fans, as well as start and stop control. Combined with real-time air quality monitoring, it creates a safe underground mine environment.

BENEFITS:

- Electrical energy savings.
- Air quality monitoring in areas of interest.
- Report generation for environmental measurements.
- Reports on fan operating times.
- Reports of fan failures.
- Visual notifications for out-of-range measurements.
- Enables timely operational and maintenance actions.
- Remote start, stop, and speed adjustment via 3D Viewer.
- Multibrand system allowing monitoring of any device.
- Prevents unexpected shutdowns and equipment damage due to overloads.

Secondary Fan Monitoring and Control

Gas Sensor

Flow Sensor in the sleeve

Tunnel Flow Sensor

Control Levels

Level 5 — Optimization Programming

Integration of Personnel and Equipment Localization

Level 4 — Monitoring, Flow Control, Gas, and Temperature

Level 3 — Event Programming

Level 2

Level 1 — Manual and Remote Control

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Haulage Monitoring and Control Module:

In underground mining, efficient control and monitoring of mineral haulage are crucial to ensure operational efficiency and safety. We present our comprehensive solution: the **Smartflow® Haulage Monitoring and Control Module.**

With this powerful tool, you'll be able to visualize mineral haulage in real-time, obtain detailed information on each movement, and make informed decisions based on precise data.

BENEFITS:

- Mineral haulage operations management.
- 3D web monitoring of real-time production.
- Compatibility with the Telemetry Module.
- Budget projection.
- Mineral production history.

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CONECTIVITY

LTE
KEEP THE CONNECTION ALL THE TIME

Leaky Feeder LTE   Optic Fiber
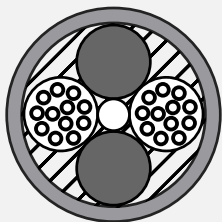
LTE / LAN NETWORKS

PERIPHERALS
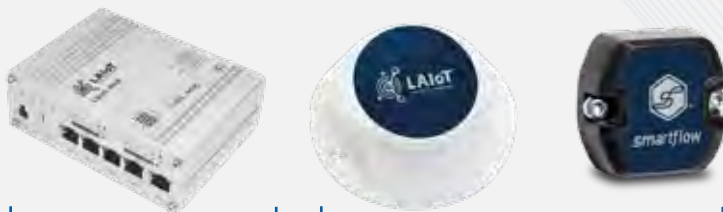
Router CPE   Beacon   Radio   Tablet   Tags

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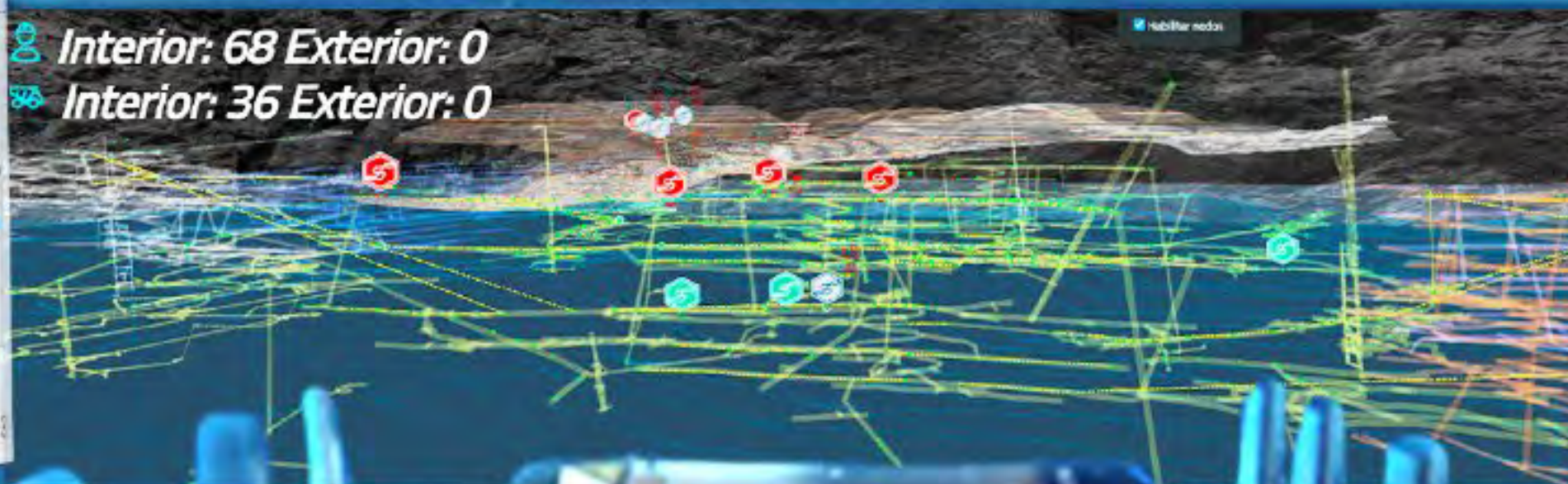
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