

GeoMoby with Cisco Wireless Solution for Underground Mines

January 2023

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Revision History

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Overview

Mine sites currently face difficulties with a lack of coverage across their operations, often covering an extended area (km²). Some underground mines may only operate within a few branches and hence cannot justify or accommodate the significant costs associated with a comprehensive wireless infrastructure.

An answer lies in the provisioning of cost-effective, easy-to-deploy, and relocatable technology. This is to create a robust, reliable, and re-deployable network, regardless of the location or complexity of the site.

Understanding the location of people and assets in real-time and the enablement of autonomous operations are necessary components in realising fully operational smart mines. Smart mines require the capability to deal with large volumes of data, specifically within tunnels, which requires enhanced network availability and corresponding visualisation tools to provide an intuitive ordering of the large volumes of information generated.

These outcomes require network and communication reliability for their customers in order to achieve high levels of operational visibility over their operations. In conjunction with Cisco's rugged environment solutions, GeoMoby aims to provide a blueprint for both a reliable operational environment network infrastructure combined with a sensor-driven visualisation layer that provides real-time insight into mining operations

Cisco's forward thinking and commitment to the future of mining aims at digitisation, automation, and net zero outcomes in mines.

Challenges

- In mining, Cisco caters to networking orchestration and automation aspects within OT environments and seeks to partner for scenario-specific industrial asset management, underground location tracking, and visualisation systems.
- While Cisco has commercially available solutions for sensor-driven environmental insights in buildings and outdoor scenarios (for example in manufacturing, utilities, and transportation;
 - In underground mining, there are specific requirements for sensor-driven connectivity and augmentation (last mile connectivity, temporary coverage, low bandwidth coverage for wi-fi black spots...) where it is entirely beneficial to collaborate to provide ecosystem-based end-to-end solutions
 - Cisco Spaces provides location and telemetry data for indoor/outdoor use cases, elements of this are leveraged to provide connectivity, environmental and location-based insights to ecosystem-based solutions.

Opportunities

- Reduce or eliminate gaps in network connectivity and communication
- All-in-one 3D map and real-time location platform that includes existing Cisco tags and infrastructure
- Convergence between OT/IT - traffic management, ventilation automation, IoT sensors data collection etc.
- New solution blueprint that extends customer value for customers leveraging Cisco solutions and global opportunity for GeoMoby

Both GeoMoby, and Cisco seek to accelerate the digitalisation of the mining industry. Through leveraging, extending and enhancing Cisco® technology within mining operations, GeoMoby will provide a readily implantable Mining platform used as a vital component in the continual optimisation of both operations and safety aspects of underground mining.

With its global coverage and commitment to the Mining vertical, both from a technology and a commercial perspective (sales and support), Cisco is in a unique position to collaborate with GeoMoby in this space to provide offerings that leverage and augment the current Cisco infrastructure coverage, while extending it into new use cases areas in productivity, and health and safety to bridge the gap between Operations Technology (OT) and Information Technology (IT).

Goals and Principles

The following key philosophies underpin this document:

- Compliance with standards
 - GeoMoby is compliant with ISO 27001 Information Management and GDPR.
- Flexibility
 - Proposed solutions or designs should be flexible to adapt to local conditions (such as remote locations).
 - Architectures should allow both existing legacy devices and protocols to be supported and enable newer Ethernet-based technologies
- Future readiness
 - Technologies proposed should have a long-term lifespan
 - A single technology platform should be used that allows new services to be deployed with ease (virtualisation at the network and application level)
- OpEx reduction
 - Use off-the-shelf vendor technologies
 - Reduce complexity
 - Simplify network management
 - Use a modular design to enable easy expansion
 - Replace obsolete technologies
 - Enable condition-based maintenance
- A collaboration between Cisco and GeoMoby, providing enhanced underground solutions, including Technical, Operations, and Infrastructure components that will cover areas relating to:
 - Location Data
 - 3D Mapping and real-time visualisation tools
 - Deployment & Scalability (cloud-based and on-premises)
 - Security
 - Diagnostic Tools (Health Checks, Remote Control Management)
 - Communication via Geofencing / Messaging alerts
 - Audio communication - Push-To-Talk
 - IoT sensors integration

Upon successful integration with Cisco Infrastructure, progress may be made toward achieving the following potential core use cases:

- Extension/Augmentation of Location-Based Services and Communications, specifically in no, to low-coverage areas
- Digital Traffic Lights
- Ventilation Automation
- Heatmaps
- IoT Sensor Data Integration (Environmental Monitoring system (humidity, temperature, oxygen, Carbon Dioxide etc), harsh brakes, picture transfer etc)
- Personnel Health Metrics Monitoring (via Smartwatches)
- Real-time Asset Locations in Tunnels

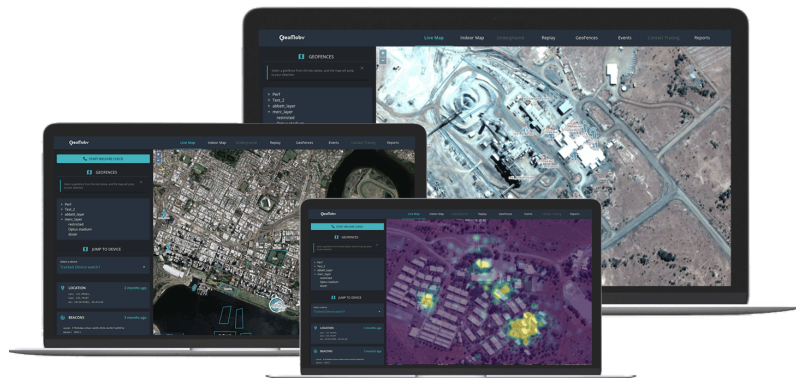
GeoMoby Mining Solutions

The GeoMoby Live Tracking Platform is a patented enterprise location technology platform that offers a 360-degree view of operations by using real-time location services and contextual awareness. GeoMoby provides visualisation of people and assets, above ground and underground, as well as health monitoring that improves safety and productivity for our key industries.

With location services, positioning, and real-time data provision, the GeoMoby platform offers an all-in-one real-time location and communication network that can achieve superior visibility of mining operations, at all times, from the surface, and improve the safety and efficiency of operations underground.

On Surface - Live Tracking Platform (LTP)

GeoMoby started the development of its Live Tracking Platform (LTP) in 2013. It offers a unique technology that enables companies to create geofences in complex environments and those with low connectivity. Our carrier-agnostic platform allows companies to visualise their people and assets with high-precision detection with an accuracy of a few meters.



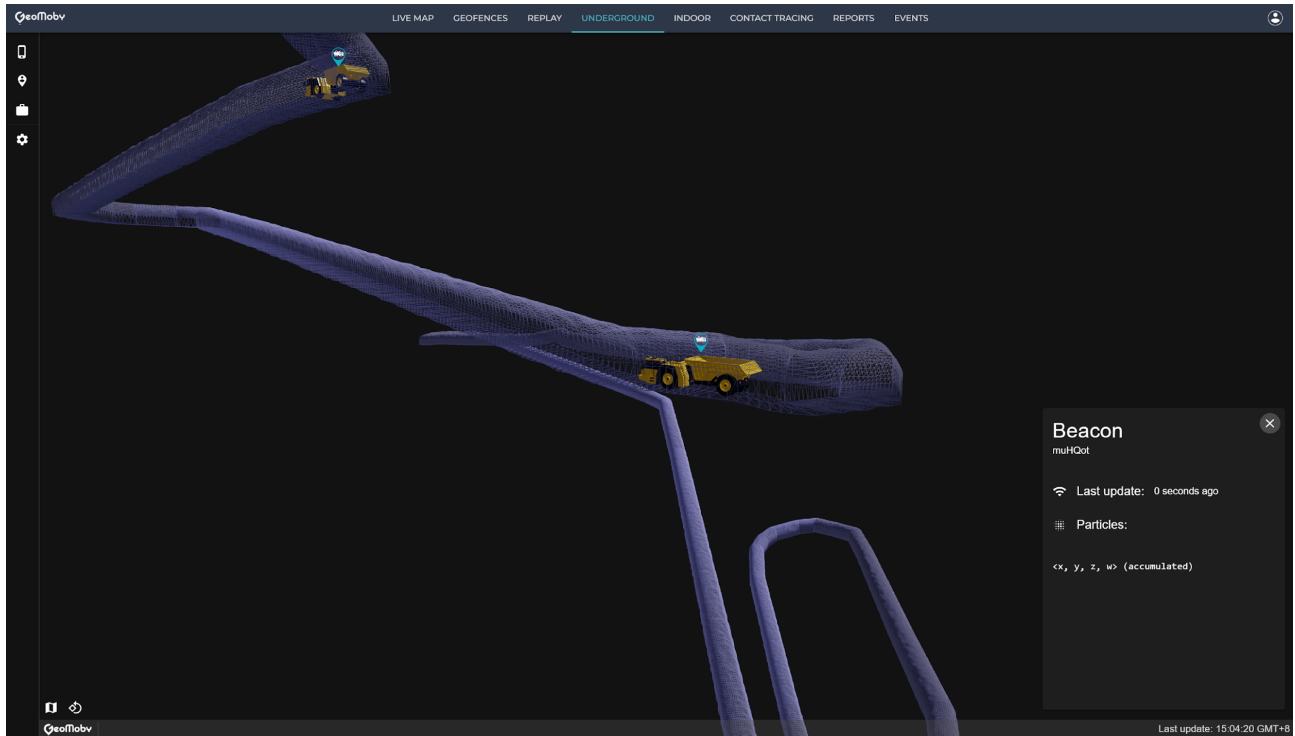
Product Differentiators

- Very Fast Deployment (<1 Day)
- Low Cost of Ownership
- Works both Indoors (3D Map) and Outdoors (Map Agnostic)
- High Accuracy Geofencing (20x better than Industry Standards)
- Smart Battery Management
- Asset Tracking
- Cultural Heritage Protection Features (Mining Explorations)

Key Benefits

- Real-time alerts - Reduce emergency response time, prevent incidents and increase the safety of workers
- Improved Workforce Management - Avoid people entering unsafe sites and prevent injuries
- Increased Productivity and Efficiency - Through delays management and automated tasks
- Contact tracing - Avoid stopping the operations and prevent an epidemic from spreading throughout the entire workforce

Underground Real-Time Location and Communication System (UG RTLCS)



The GeoMoby UG RTLCS uses superior BLE Enabled Technology and Location Services, delivering high accuracy, real-time, location services, and live monitoring of people and assets, for the mining industry.

It is a 100% Wireless and Cableless Technology: Our engineers developed such a network underground by using BLE5 technology, a proprietary network, and battery-powered nodes to generate live data.

Our system is a World-first BLE-based Communication for Underground Operations, our BLE5-enabled nodes allow files to be sent from underground tunnels to the surface, with the potential to expand to audio and videos as well.

A Provisional patent against our Proprietary Underground Location and Communication Network has been filed in December 2021 (Provisional Patent No 2021904093).

Product Differentiators

- 100% wireless (no electrician needed, no impact on current operations)
- Highly expandable and easy to deploy (plug-and-play solution)
- Compatible with standard Android devices
- IoT integration (EMS already supported)
- Self-monitoring and self-healing system
- Long range (up to 300 m)
- Battery-powered (10 to 12 months)

Key Benefits

- Lowest cost of ownership
- Easy integration with existing infrastructure
- Real-Time Asset and personnel location tracking
- Mine Automation (ventilation systems)
- Traffic Management
- 2-way text communications
- Proximity awareness
- Last mile connectivity

Hardware

Underground Nodes

Weight:

- 3kg

Battery:

- Type: LiFePO4
- Capacity: 120Ah (384Wh)
- Voltage: 3.2Vdc
- Certification: IEC 62619: 2017
- Dimensions: 28.5cm (height) x 8.2cm (width) x 18.9cm (length)
- Battery Life: 10-12 months per charge
- Charging Time: 24h

PCB:

- nRF52840 SoC



BLE Tags



Type 1
Industrial tag



Type 2
Hard Hat tag



Type 3
Personnel Card Tag



Type 4
Asset Tracking tag

Smartwatches

GeoMoby can provide smartwatches equipped with the GeoMoby UG Zero Harm app and customised to your needs. The smartwatches are standalone and do not require to be paired with a mobile phone - They come with a 4G SIM card and can be used both underground and on the surface.

Smartwatches can collect health metrics such as body temperature, and heartbeat, and can work with wearables in order to collect other data such as SpO2 levels etc.

Specification example of one of our watches:

- Display
 - Screen Size: 1.6" inch
 - Display Type: IPS LCD
- Body
 - Size: 52.5 x 52.5 x 17mm
 - Weight: 100g
- Software
 - Android: version 10.7
- Battery
 - Battery Capacity: 1260mAh
 - Charging Technology: 2 hours
- Body Resistance
 - Body Protection: Life Waterproof
 - Glass Technology: Tempered Glass
- Sensors
 - Sensors/Functions: g-sensor, heart rate monitor
 - Satellite Positioning: GPS/GLONASS/A-GPS/Beidou
- Camera
 - Camera Type: 13MP Rotatable Camera with flashlight
- Connectivity
 - SIM Slot: Nano SIM GSM+WCDMA+FDD-LTE+TDD-LTE
 - WiFi: 2.4GHz/5GHz 802.11 a/b/g/n
 - NFC: None
 - Bluetooth: BLE 5



Environmental Monitoring System (EMS12)



The RDI-EMS 12 Environmental Monitoring System is an advanced, all-in-one device, designed for the harshest mining conditions with the following features:

- Monitor temperature (wet and dry bulb), wind (speed and direction), humidity, gases and dust from the safety of your office in real-time.
- Gas Sensors to detect O₂, CO, CO₂, NO₂, H₂S, CH₄, NH₃

Mobile Apps

On-Surface

The Zero Harm app has been developed to collect asset locations in real-time and provide advanced geofencing capabilities (safety alerts, productivity monitoring etc)

The app is extremely fast to deploy, only requires a few clicks to work and comes with the following features:

- Personnel and asset tracking
- Advanced Geofencing
- Real-time messaging
- Automatic safety alerts based on a predefined set of rules
- When used with a GeoMoby smartwatch, health metrics such as heart rate, body temperature, SPO2, can also be collected and monitored
- Available on Android and iOS devices

Underground

The Underground Zero Harm app (UG Zero Harm) is a mobile app developed by GeoMoby to run on standard Android-based mobile devices used in underground mining. The app provides the following features:

- Personnel and asset tracking
- 2-way communication
- Real-time messaging (broadcast or individual)
- Geofencing
- Automatic safety alerts based on a predefined set of rules
- Proximity awareness
- When used with a GeoMoby smartwatch, health metrics such as heartbeat, body temperature, SPO2, can also be collected and monitored
- Available on Android devices

Lab Deployment and Cisco Integration

The GeoMoby team was offered to demonstrate that our system could be used along the Cisco suite of products for mining deployments. The tests have demonstrated the following 2 use cases:

1. Integration of Cisco location and telemetry data into the GeoMoby live 3D mapping solution
2. Integration of the GeoMoby gateway with a Cisco Access Point via direct connection in order to demonstrate network augmentation, an extension of temporary or more permanent connectivity into challenging areas with GeoMoby gateways

The following Cisco components have been deployed in our lab:

Component	Role	Type	Version
9800-CL WLC	Cisco AirOS Wireless LAN Controller	Virtual	IOS XE 17.6.4
Cisco Wi-Fi Tags	Location Tag	Hardware	Centrak ITD-761E
Cisco BLE Tags (Kontakt)	Location Tag	Hardware	Kontakt IoT 2.2
Cisco Telemetry Tags (MineW)	Location & Telemetry Tag	Hardware	S1
Cisco Aironet 1560/1570 Series Industrial Access Points	Cisco Access Points	Hardware	17.6.4.56
Cisco Catalyst 9100 AX Series Access Points	Cisco Access Points	Hardware	17.6.4.56
Spaces Connector	Virtual connector between controller and cloud Cisco Spaces	Virtual	ova-2.3.497
Prime Infrastructure	Cisco wireless and wired network management tool	Virtual	3.10
Cisco Spaces	Cisco cloud-based location services platform	Cloud	Cloud version



Cisco Aironet 1572E Industrial Access Points



Cisco Catalyst 9100 AX Series Access Points



Centrak ITD-761E
Wifi Tag



Kontakt.io Asset Tag
BLE Tag

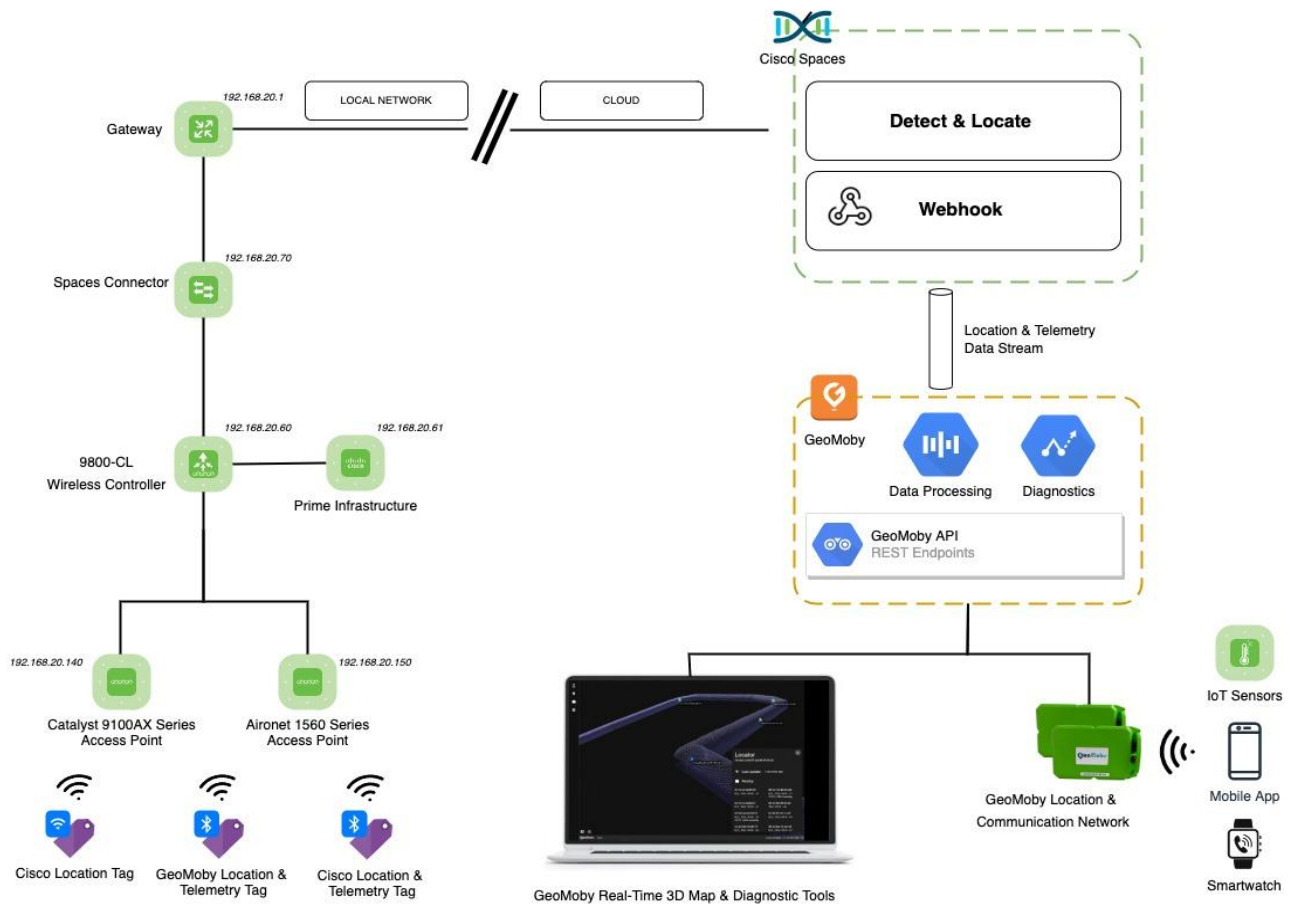


Kontakt.io Anchor Tag
BLE Tag



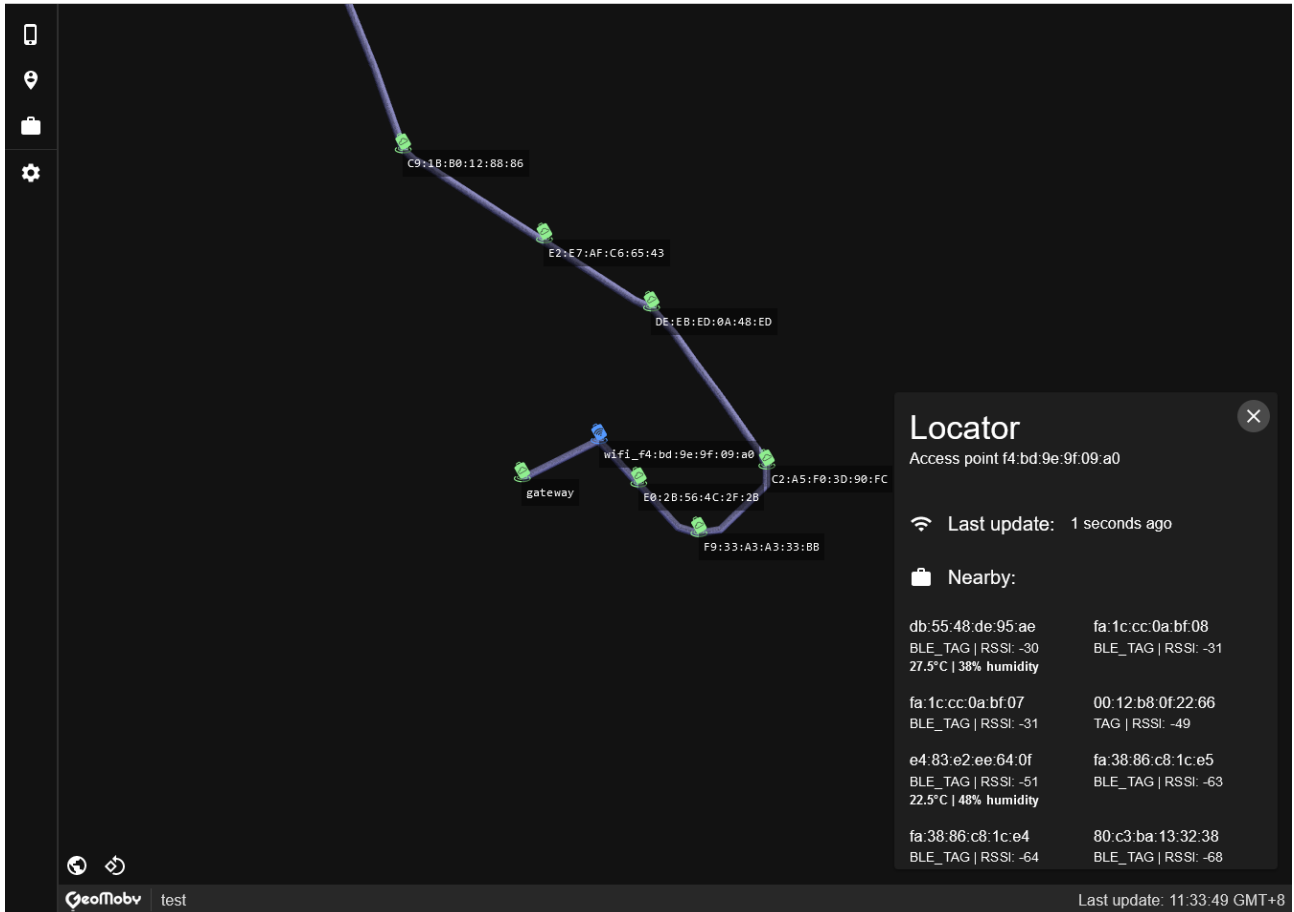
MineW SI Telemetry Tag
BLE Tag

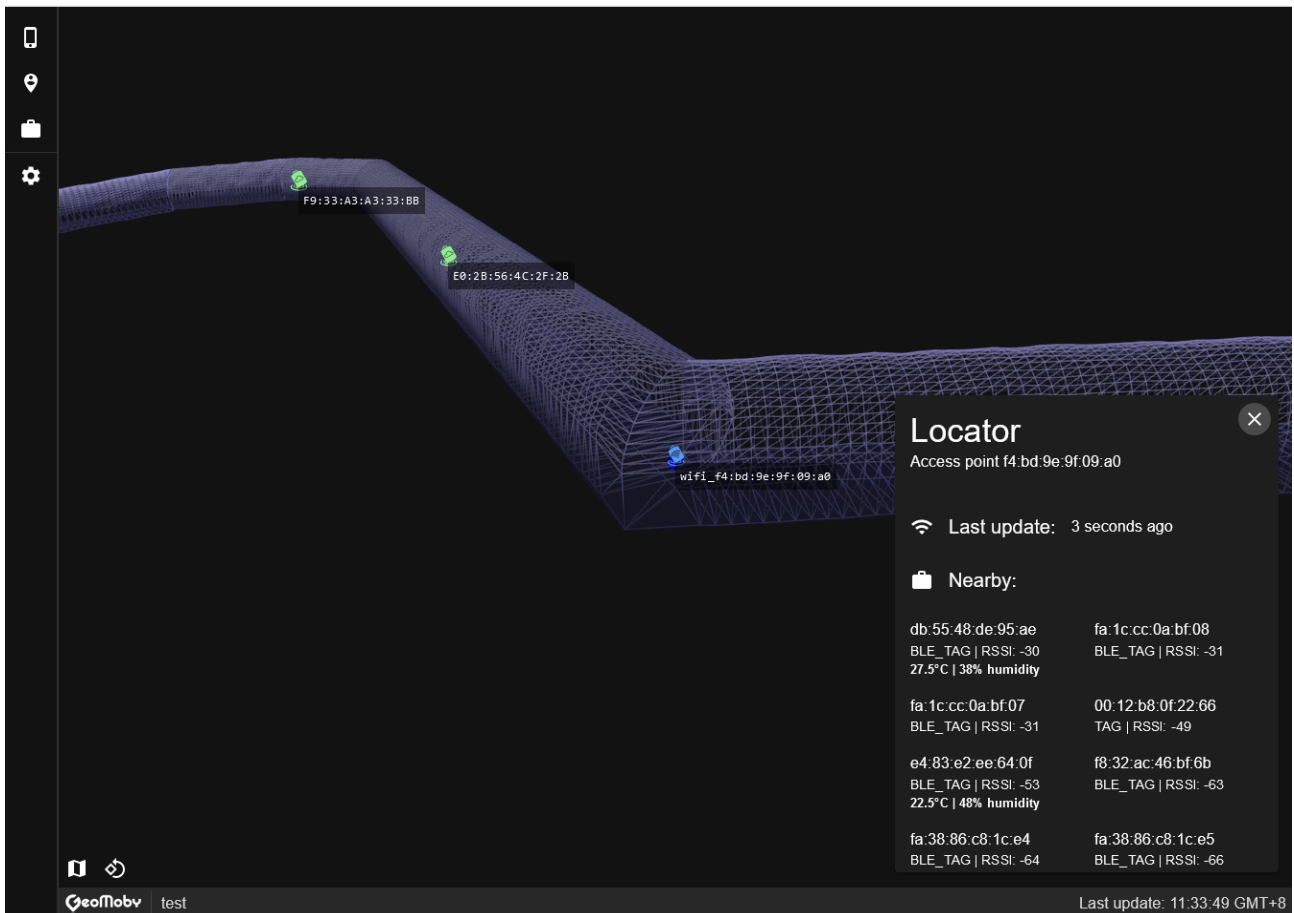
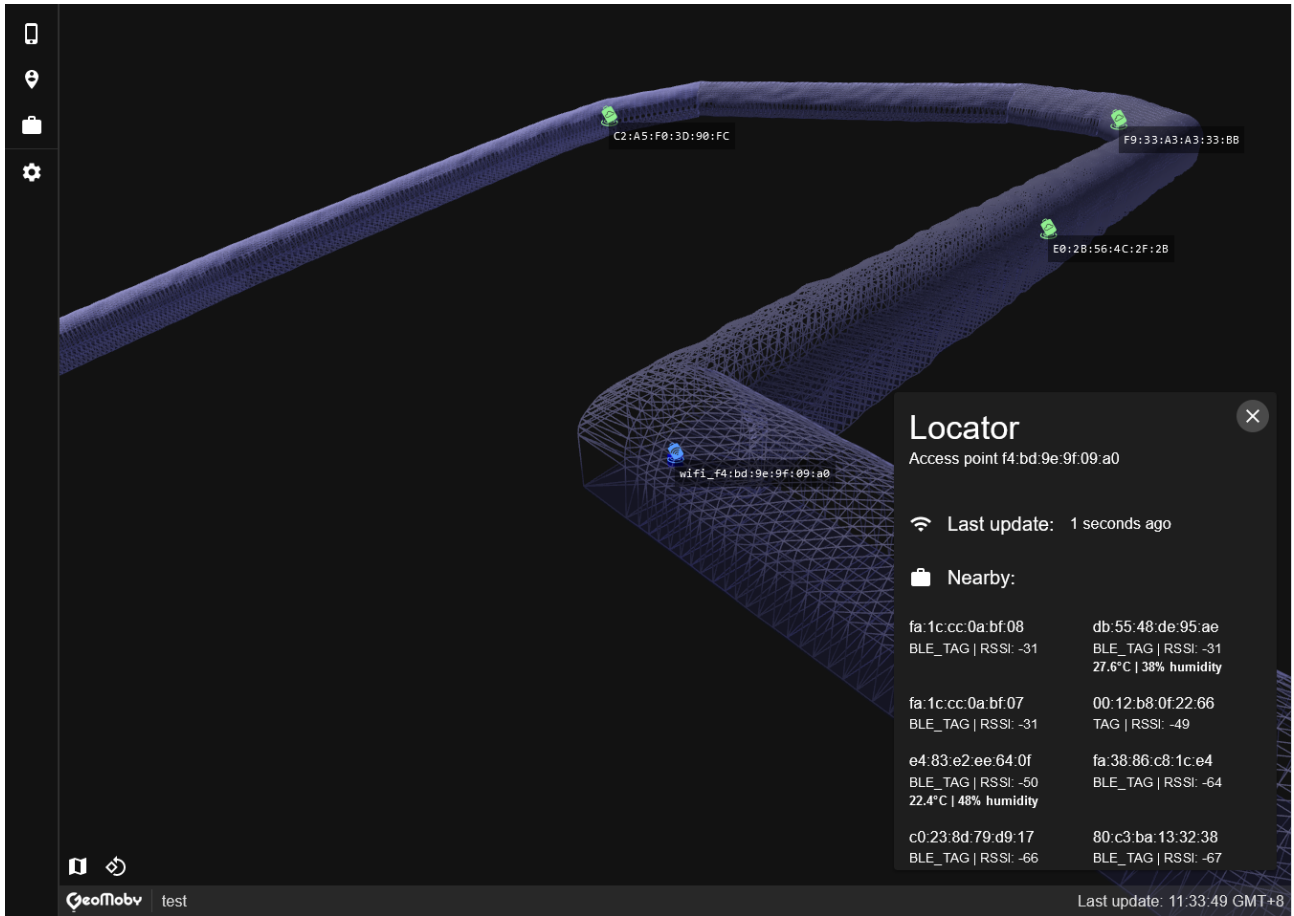
GeoMoby Lab - Logical Network Configuration Overview



Below are the results of the integration; showing a Cisco Access Point as part of our 3D map and test network. The 3 illustrations show the access point measurements and tag location with different views.

Telemetry data (humidity and temperature) are also shown when telemetry features are enabled.





Example of Telemetry values available via the Cisco Tags and Cisco Spaces:

Precise Temperature ⓘ

20.76171875 °C

Updated at: Nov 18th, 2022 11:20:48 AM
a few seconds ago

Humidity ⓘ

49 %

Updated at: Nov 18th, 2022 11:20:48 AM
a few seconds ago

Button Counter ⓘ

Duration
18+ hrs

Counter
0

Updated at: Nov 18th, 2022 11:20:48 AM
a few seconds ago

Movement Counter ⓘ

Duration
18+ hrs

Counter
0

Updated at: Nov 18th, 2022 11:20:48 AM
a few seconds ago

Acceleration ⓘ

Coordinates (X, Y, Z)	Sensitivity
(-2, 32, -115)	16

Updated at: Nov 18th, 2022 11:20:48 AM
a few seconds ago

Cisco Network Requirements

Network Configuration

An existing Cisco infrastructure should already be in place. For the GeoMoby System to augment network coverage, the GeoMoby Gateway should have access to:

1. Standard Power socket (230V) or PoE
2. Wi-Fi SSID and associated Pre-Shared Key (PSK) - Our recommended option is for a new SSID to be created and reserved for GeoMoby UG RTLS. Only GeoMoby components (gateways) should be allowed to connect to this SSID
3. Internet Access (http, https, web sockets)

IP Addressing and DHCP

GeoMoby routing is proprietary and does not require any specific configuration on the Cisco side except for the gateway to have internet access in the case of a Cloud-based deployment.

Authentication and Authorisation

GeoMoby UG RTLS does not require authentication and authorisation to operate.

Wireless Site Survey

A wireless site survey of the mine area is not required to complete a successful deployment of the GeoMoby underground mine network, however, it is highly recommended. The GeoMoby Deployment Team would require a map file of the mine (.dxf etc) and will determine the approximate location for each node - the exact location will be defined by the Technician via the GeoMoby Aid of Deployment Tool (Gauger) during installation.

Post-installation, the GeoMoby Support Team will monitor the overall network health status via the GeoMoby Underground Diagnostic Suite.

Nodes can be re-deploy any time and will only require a change in the mapping configuration that can be done once redeployed.



GeoMoby Aid of Deployment Tool (Gauger)



Opportunities and Challenges

It is becoming an undeniable truth that the transformation to an electrified and automated mine is essential to the longevity of the mining industry, not only relating to the continued extraction and production of vital resources, but also for a safer, cleaner, and greener future.

Most recently, the shift to clean energy has become a major focus for the mining industry with its contribution to global CO2 emissions currently measured at 2 to 3 percent. As a result, mining companies are facing considerable pressure from multiple stakeholders such as investors, regulators, and customers to act and reduce emissions.

Some of the largest miners in the world are taking the lead with goals set within their ESG decarbonisation plans and guidelines that include 15 to 30 percent reductions in CO2 emissions by 2030.

The world market is now reflecting such desires and planned action as seen in a Tersus Strategy Report entitled 'Global Electric Mining Equipment Market 2022-2030', the:

"... underground electric mining equipment market, is projected to be the largest market during the forecast period"

There is a wide range of benefits for the industry in reducing and ultimately completely eliminating the use of fossil fuels while making the move towards electrification and implementing the process of using electric sources of energy to power a mine.

Henrik Ager, President of mining equipment manufacturer Sandvik Mining and Rock Solutions, part of the Sandvik engineering group states:

"Electrification is going to be one of the biggest technology shifts we've seen in the mining industry,"

"For the past 70 years or so, mining has relied on diesel-powered machinery, which tends to be hot and noisy while generating particulate emissions. But the future looks very different"

One major key benefit of mine site electrification is the removal of diesel and associated diesel exhaust emissions that produce harmful chemicals that put workers at risk of significant health issues such as respiratory diseases and cancer.

A reduction in the use of diesel-powered machinery and vehicles also reduces the dependence of underground sites on ventilation systems that currently run, nearly exclusively, 24/7/365. With a severe lack of visibility of worker movements, entry, and exit, in underground mines, ventilation systems cannot currently be shut off. By eliminating diesel particulate emissions, ventilation and cooling can be reduced, resulting in substantial cost savings.

Some of the key challenges faced before these goals can be achieved, however, are a result of deeply embedded infrastructure and operations that have been the industry standard for an extensive period of time, not to mention severe worker shortages, complex and remote work environments, and difficult working conditions.

While the mining industry is noted and recognised for its support and investment in bringing new technologies and innovations to the world, it is becoming clearer that these solutions and achievements of new advances in technological progress will come from collaboration between both the major players in the mining and metals sector, such as Cisco and the emerging contributors such as GeoMoby who bring unique, ground-breaking, solutions to unsolved and long-standing issues, specifically for underground mining operations.

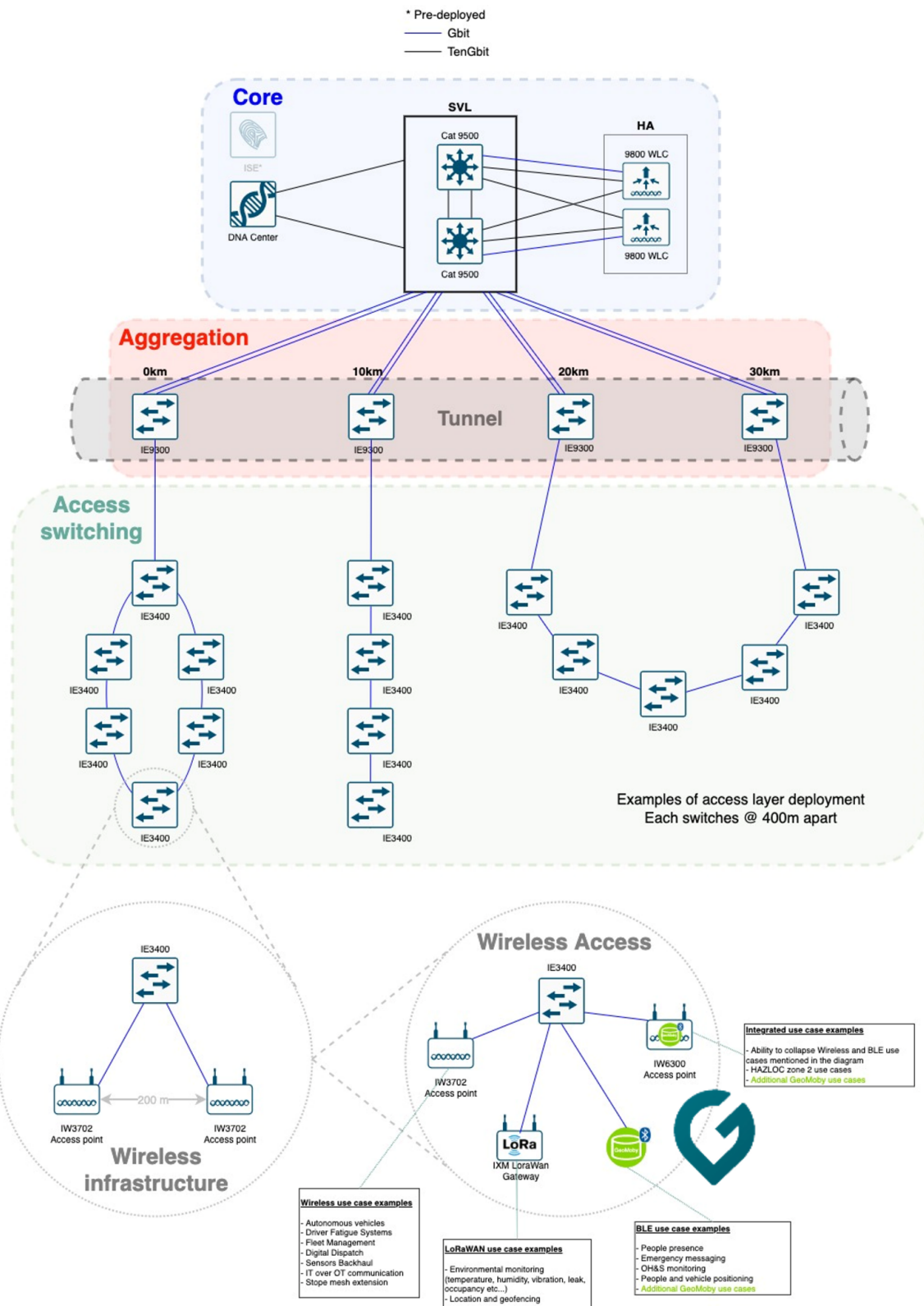
The path to automation, for example, requires flexibility, an upskill of worker knowledge, specifically in relation to data and digital literacy skills, adaptive technologies, and an uninterrupted, reliable communications network in environments where there may be no cellular or wireless capabilities available.

The opportunity, therefore, as uncovered in a Cisco IoT article authored by Vikas Butaney - *Mining: An Essential Industry Transforming with Automation* - is the further exploration and implementation of IoT wireless mesh infrastructure across mine sites. Cisco has already begun trials with customers that allow the delivery of apps to mobile fleets enabling remote and autonomous control of equipment. Further fine-tuning of these types of implementations are likely to bring continued reductions in operation costs, increased efficiency, and improved worker safety.

Working together with the collaboration of technologies, Cisco and GeoMoby will continue to bring progress and solutions to connectivity and communication challenges for underground mining operations.

Underground Wireless Solution and Logical Network Design Overview

Below is the overall network architecture of the GeoMoby integration within a Cisco infrastructure:



GeoMoby 3D Map - Example of integration with a Cisco Catalyst 9100 AX Series access point

The screenshot shows a 3D map interface with several nodes connected by lines. A 'Locator' popup window is open, displaying the following information:

- Locator** (Close button X)
- Access point f4:bd:9e:9f:09:a0
- Last update: 65 seconds ago
- Nearby:
 - 00:12:b8:0f:22:66 TAG | RSSI: -22
 - 42:00:00:00:01:95 INTERFERER | RSSI: -70
 - 42:00:00:00:01:93 INTERFERER | RSSI: -73
 - 42:00:00:00:01:55 INTERFERER | RSSI: -82

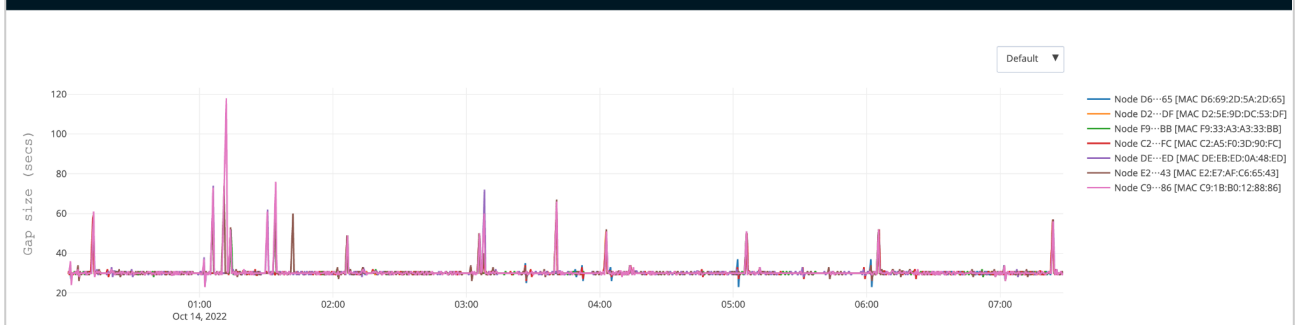
At the bottom of the map, it says 'GeoMoby test' and 'Last update: 17:02:29 GMT+8'.

GeoMoby Underground Diagnostics - Network stability overall chart

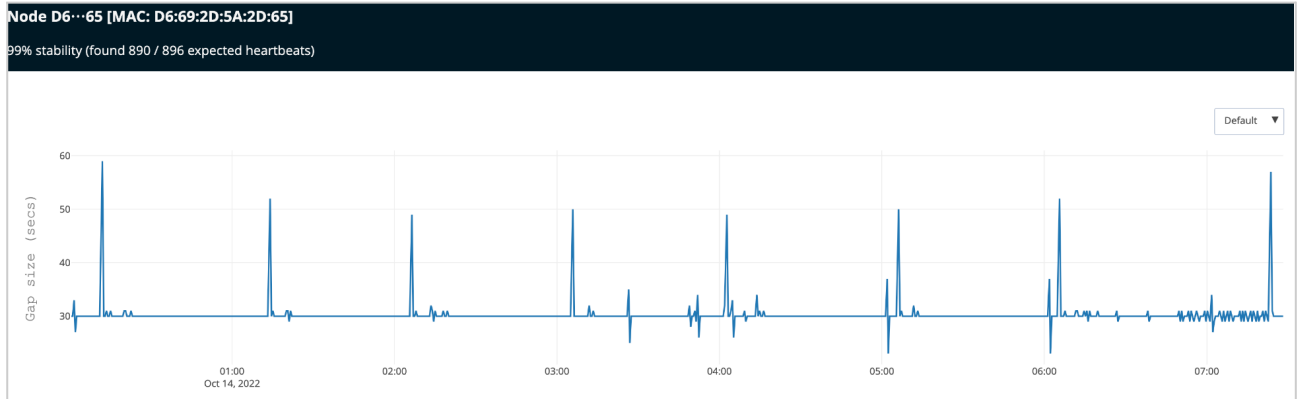
Device	Switched on	Stability	First message	Last message	Short gaps	Long gaps	Battery voltage
Node D6...65 [MAC: D6:69:2D:5A:2D:65]	true	99% (890 / 896)	2022-10-14T00:00:07.000Z	2022-10-14T07:28:11.000Z	98%	1%	3.2V - 3.3V
Node D2...DF [MAC: D2:5E:9D:DC:53:DF]	true	99% (890 / 896)	2022-10-14T00:00:04.000Z	2022-10-14T07:28:08.000Z	99%	0%	3.2V
Node F9...BB [MAC: F9:33:A3:A3:33:BB]	true	99% (890 / 896)	2022-10-14T00:00:16.000Z	2022-10-14T07:28:20.000Z	99%	0%	3.3V
Node C2...FC [MAC: C2:A5:F0:3D:90:FC]	true	99% (888 / 896)	2022-10-14T00:00:28.000Z	2022-10-14T07:28:10.000Z	98%	1%	3.2V
Node DE...ED [MAC: DE:EB:ED:0A:48:ED]	true	98% (884 / 896)	2022-10-14T00:00:20.000Z	2022-10-14T07:27:56.000Z	98%	1%	3.2V - 3.1V
Node E2...43 [MAC: E2:E7:AF:C6:65:43]	true	98% (884 / 896)	2022-10-14T00:00:14.000Z	2022-10-14T07:28:21.000Z	98%	1%	3.3V
Node C9...86 [MAC: C9:1B:B0:12:88:86]	true	98% (881 / 896)	2022-10-14T00:00:17.000Z	2022-10-14T07:28:23.000Z	98%	1%	3.3V

Gaps sizes between messages: All Nodes

2022-10-14T00:00:00.000Z - 2022-10-14T07:28:25.000Z



GeoMoby Underground Diagnostics - Network stability individual node chart

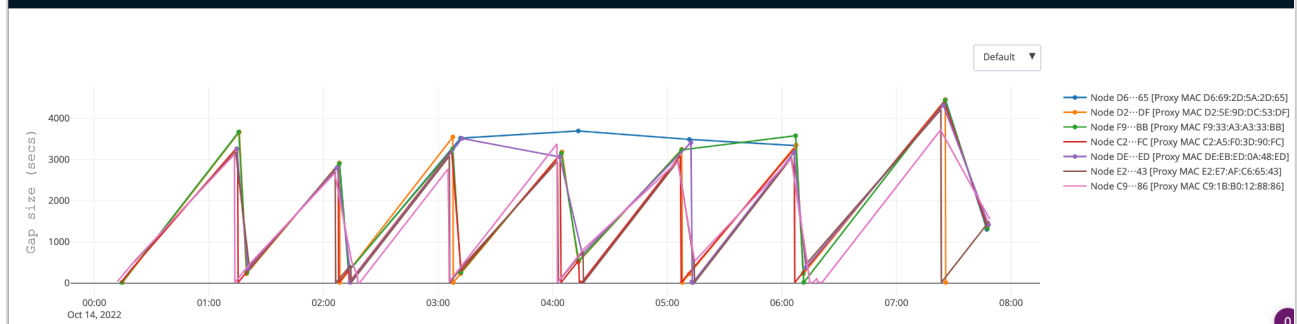


GeoMoby Underground Diagnostics - Observations reports as seen on the network

Device	Switched on	Beacon messages	First message	Last message	Short gaps	Long gaps
Node D6...65 [Proxy MAC: D6:69:2D:5A:2D:65]	true	12 (all beacons)	2022-10-14T00:14:32.236Z	2022-10-14T07:47:20.323Z	0%	100%
Node D2...DF [Proxy MAC: D2:5E:9D:DC:53:DF]	true	18 (all beacons)	2022-10-14T00:14:29.92Z	2022-10-14T07:25:48.542Z	29%	70%
Node F9...BB [Proxy MAC: F9:33:A3:A3:33:BB]	true	16 (all beacons)	2022-10-14T00:14:10.549Z	2022-10-14T07:47:37.64Z	13%	86%
Node C2...FC [Proxy MAC: C2:A5:F0:3D:90:FC]	true	30 (all beacons)	2022-10-14T00:13:21.183Z	2022-10-14T07:47:42.275Z	44%	55%
Node DE...ED [Proxy MAC: DE:EB:ED:0A:48:ED]	true	17 (all beacons)	2022-10-14T00:20:15.194Z	2022-10-14T07:48:14.377Z	18%	81%
Node E2...43 [Proxy MAC: E2:E7:AF:C6:65:43]	true	24 (all beacons)	2022-10-14T00:12:20.48Z	2022-10-14T07:48:36.705Z	26%	73%
Node C9...86 [Proxy MAC: C9:1B:B0:12:88:86]	true	45 (all beacons)	2022-10-14T00:11:24.724Z	2022-10-14T07:48:54.492Z	52%	47%

Gaps between observation messages: All Nodes

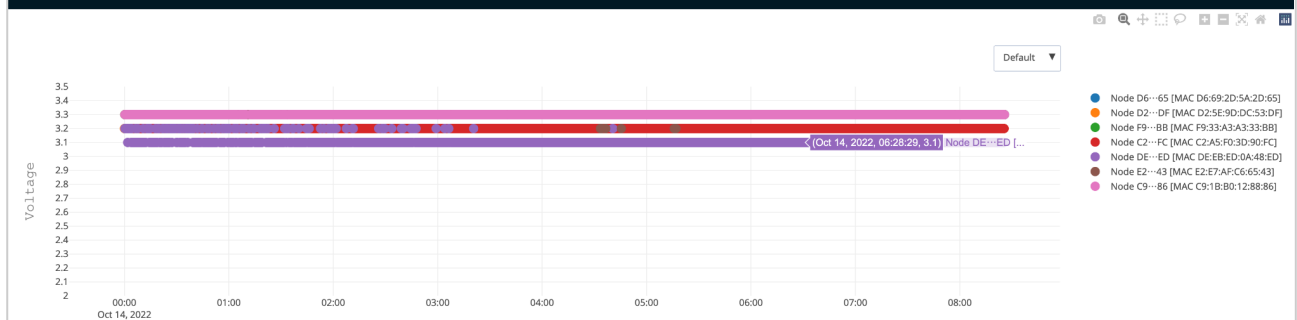
2022-10-14T00:00:00.000Z - 2022-10-14T08:25:41.000Z



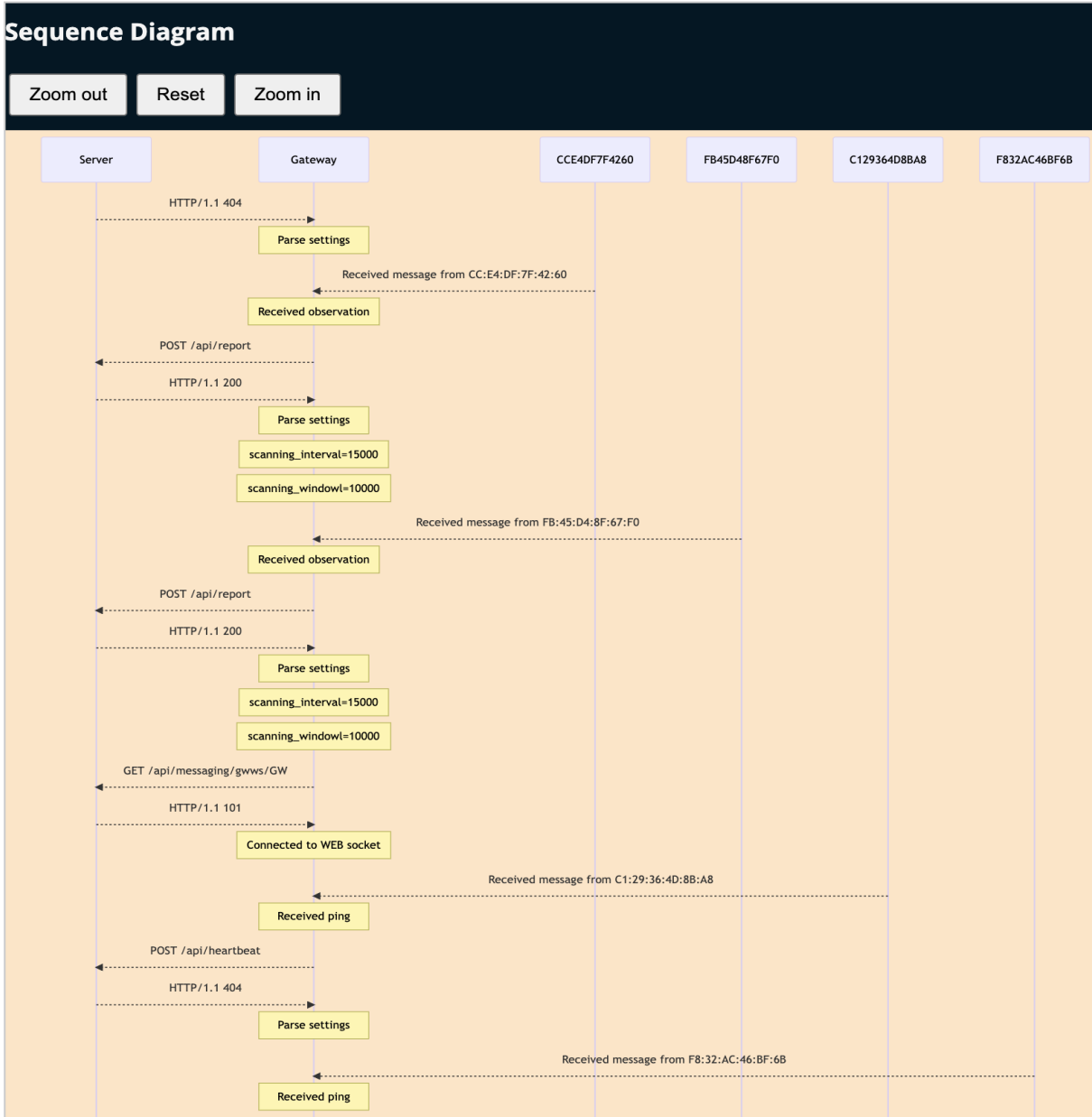
GeoMoby Underground Diagnostics - Battery voltage monitoring

Battery Voltage: All Devices

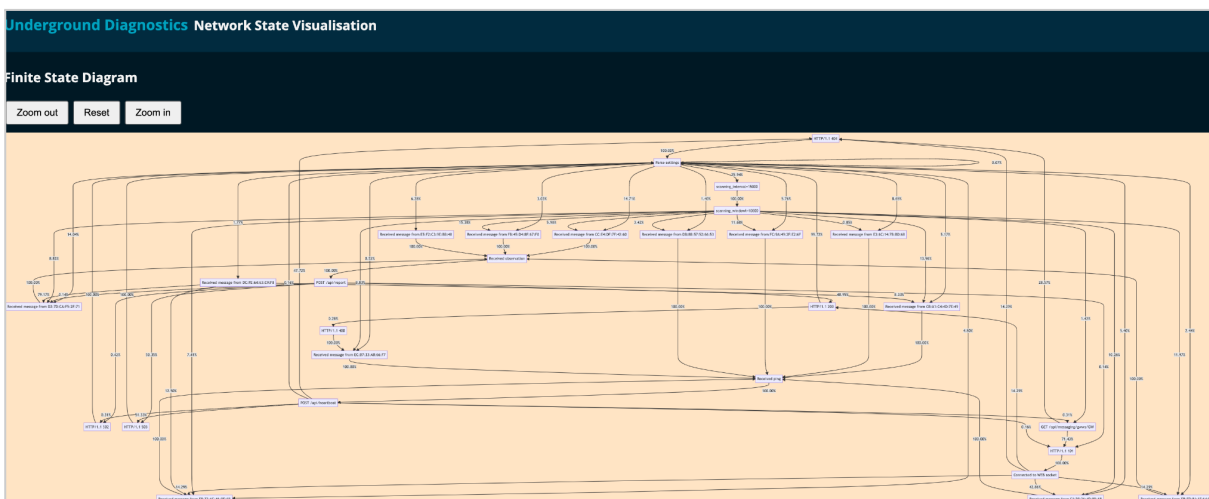
2022-10-14T00:00:00.000Z - 2022-10-14T08:25:41.000Z



GeoMoby Underground Diagnostics - Live Network State Sequence Diagram Analysis



GeoMoby Underground Diagnostics - Live Network State Diagram Analysis



Applications

Industry Use Cases Examples

- Capture time lost because of interruptions to production, calculating and accurately measuring delays
- Support transport clients operating in tunnels by monitoring and tracking utilities and lightweight vehicles and assets
- Event-based alerts regarding harmful gasses and readings, the vibration of tailing piles, temperature, and adverse atmospheric conditions
- Development of digital traffic lights and a breadcrumb trail visualisation tool
- Ventilation Automation
- ESG Compliance

Wireless Use Case Examples

- Autonomous vehicles
- Driver fatigue systems
- Fleet management
- Digital dispatch
- Sensors backhaul
- IT /OT convergence
- Stope mesh extension

LoRaWAN Use Case Examples

- Environmental monitoring (temperature, humidity, vibration, leak, occupancy etc.)
- Location and geofencing

BLE Use Case Examples

- People presence
- Emergency messaging (broadcast or individual)
- OH&S monitoring
- People and vehicle positioning

Integrated Use Case Examples

- Ability to collapse Wireless and BLE use cases
- Integration with Cisco HAZLOC zone 2 devices

Useful References

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Appendix - Onsite Installation



About Cisco

Cisco is the worldwide leader in networking that transforms how people connect, communicate, and collaborate. Information about Cisco can be found at <https://www.cisco.com>.

About GeoMoby Underground Solution

A Proprietary Real-Time Location-Based Wireless and Cable Free 3D Visualisation and Communication System for Underground Operations. The GeoMoby underground RTLS and communication system allows to monitor and visualise people and assets, using BLE technologies (e.g. BLE nodes and cards) to create a virtual, live 3D map of underground tunnels and site operations that can be used to visualise, in real-time, all movement of equipment, vehicles, and people underground. Together with that, the system can be used to exchange messages between the control centres, people, and assets underground. Information about GeoMoby can be found at <https://geomoby.com>.