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IMPROVING WORKSITE SAFETY

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Parent company of 365mesh, Outcomex sought to create a solution that would make work environments safer, especially within the mining, oil and gas industries.

In the period 2022-2023, it was recorded that there was one fatality, 83 serious injuries, 205 lost time injuries and 767 total recordable injuries reported to the Regulator. This means that mine workers need to always be highly alert and aware when on-site, whether they are operating heavy machinery or not.

Seeing a gap where technology could reduce these numbers, and create a safer environment, Outcomex created Greenmesh housed under its IoT platform, 365mesh.

When deploying IoTsolutions, Outcomex often utilises multiple Cisco products - Greenmesh was no different. Enhancing situational awareness through our innovative technology solutions and by providing monitoring and real-time alert notifications, gives the mining, oil and gas sector the ability to improve its workspace, elevate staff safety and ensure a smarter, stress-free workplace.

Maintaining a safe work environment is imperative in every sector, but never more so than in the mining, oil and gas industries where incidents are often severe, if not fatal, when they occur.
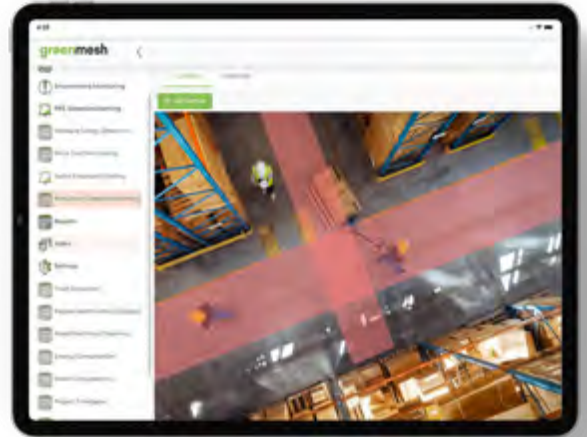
Due to the nature of the industry, there are multiple inherent risks associ-ated with mining, such as slip and trip falls, being hit by heavy machinery, on-site risk, and exposure to harmful chemicals (like toxic and hazardous gases) which can cause a host of long-term detrimental disorders. This means that mine workers need to always be highly alert and aware when on-site, whether they are operating heavy machinery or not.

Risks, such as mine gas, fires, and dust, including accidents caused by the loss of control of heavy machinery, are some of the most major issues within the mining industry, with severe, if not fatal, consequences. Due to the complex nature of the mining environment, including its geology, most of these issues are difficult to control making it inherently dangerous. There are, however, technologies that can be implemented to mitigate these haz-ards, reducing worksite incidents and fatalities, and creating a safer work environment for mine workers.

This is why Greenmesh, one of 365mesh's IoT solutions ,was created - to improve and enhance worksite safety. 365mesh is an end-to-end IoT platform aimed at providing innovative IoT solutions to solve multiple industry problems. Parent company of 365mesh, Outcomex often integrates and utilises mutiple Cisco technologies in its offerings, this is no different when it comes to deploying IoT solutions.

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Enhancing situational awareness through technology

365mesh's Greenmesh solution utilises advanced artificial intelligence (AI) and machine learning (ML), as well as purpose-built sensors, to help prevent worksite accidents and fatalities by providing early detection and warnings of potential high-risk accidents before they occur. By utilising intelligent, cloud managed camera from Cisco Meraki, Greenmesh is able to create safer work environments and smarter spaces across multiple areas.

Diving deeper into the tech used

Cisco Meraki MV72 cameras are utilised as as our primary detection device in conjunction with 4 Edge Sensors (noise, dust, weather and vibration sensors). Based on the readings from these sensors and object detection streams from the cameras, whenever a rule threshold is triggered, video clips are captured with +- 1 min from the time of event and the Outcomex-patented EdgeAI enrichment happens, extracting information from the video and audio along with the sensor payloads.

Although these cameras have advanced techniques in convolutional neural networks to accurately detect and count objects (vehicles/people) based on the video feed (computer vision based), none of these techniques go further to achieve the utilisation of analytic use cases required in the construction and human safety and environment sector. Integrating our own AI/ML algorithms automatically gathers the analytical information required with the following accuracy levels:

- 93.71% accurate PPE Compliance Safety warnings
- 98.66% Man fall detection Safety warnings.
- 78.02% Construction vehicle / Machinery Collison warnings
- 87.86% Smart Environment Safety Reporting Compliance event filtering

Our deployment consists of edge compute on the Cisco Industrial IR1101 router that also acts as Orchestrator + Hub, Edge AI device for performing the AI inferences at edge and allow the cameras to process data at the edge which requires far less bandwidth and is more affordable for our customers and finally higher order AI capabilities and Compliance analytics via the Cloud computing in our Greenmesh Cluster. The deployment also consists of edge alert notification systems via the Industrial microcontrollers performing real time alerts via horn speakers and hazard light systems.
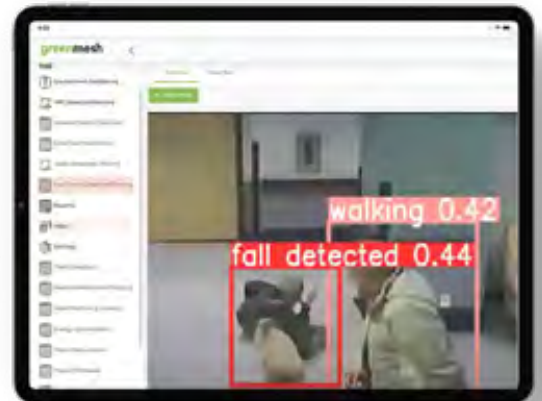
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PPE detection

Ensuring mine workers are equipped with the right attire is imperative to create a safe work environment. Through deploying Greenmesh, personal protective equipment (PPE) is closely monitored to verify if workers are wearing the appropriate safe attire. By identifying PPE items, like safety headgear, glasses, and vests, as well as monitoring whether workers are properly wearing PPE while on site, Greenmesh has the ability to restrict workers from entering job sites if all the safety wear required is not detected – alerting proper personnel so that appropriate action can be taken. This is achieved though the utilisation of real-time electronic RFID tags. This unique identification feature can identify workers who do or do not comply with PPE standards, increasing the implementation of site safety monitoring around exclusion zones and machinery safe distancing.
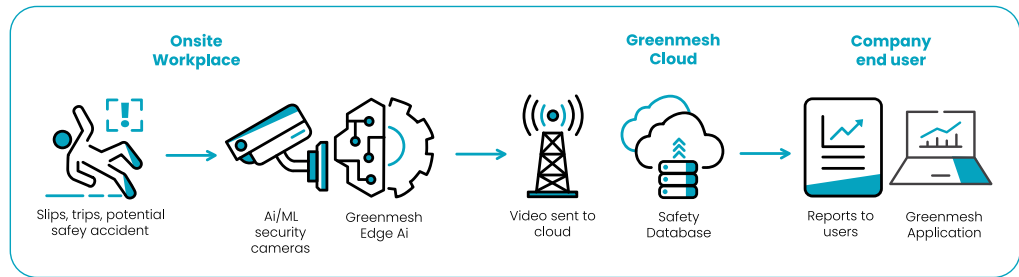

Man-down alerts

Slip and trip falls are major concerns at surface mines, as they contributing to significantly to the high number of non-fatal incidents reported by mines yearly. Greenmesh uses machine perception and video analytics to detect either a single person or multiple people who have fallen or slipped and then triggers instant alerts to authorised personnel so they can check on the safety of their employees immediately. Additionally, with the use of man down alerting, a count record of areas with repeated trips and fall incidents is collated, giving users an accurate record of accident occurrences (if they are not reported by workers), and also allows them to take remedial action to ensure these areas are made safer.

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Real-time alert notifications

Onsite Workplace   **Greenmesh Cloud**   **Company end user**

Slips, trips, potential safey accident → Ai/ML security cameras → Greenmesh Edge Ai → Video sent to cloud → Safety Database → Reports to users → Greenmesh Application

Monitoring air abnormalities

By monitoring air quality and composition, and detecting various hazardous air particles, like crystalline silica dust and other respirable dust substances, automatic alerts are sent to control rooms if there are any abnormalities in the air in mining and drilling environments (whether outdoor or underground). This alert allows workers to leave the environment until such time as the air quality becomes clearer or allows workers to wear the appropriate gear to protect themselves. Additionally, the worksites' noise levels from activities, such as welding, drilling, digging and loud machinery vehicles and vibration performance, is monitored in real-time. This gives you the ability to set noise level thresholds based on compliance limits that trigger immediate alerts to prevent regulatory thresholds from being breached.

A winning partnership: Outcomex & Cisco

> **As a Cisco Gold Partner, we have a deep understanding of the entire Cisco portfolio and the diverse architectures of a customer is an asset when deploying Cisco solutions.**

As a Gold Partner, we hold 20 Cisco Specialisations, including Cisco Industrial IoT Specialisation.

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Heavy machinery collision avoidance

Greenmesh's solution is used to determine safe distances between workers and moving machinery/equipment with exclusion zones. This involves the installation of strategically placed blind-spot detection and driver monitoring cameras onto vehicles to give drivers real-time warnings of hazardous collision risks, such as other objects or people who are close by. 365mesh algorithms in the cameras allows users to create a virtual safety and exclusion zone radius around potentially dangerous machinery, monitor these areas and receive real-time alerts when an unauthorised worker or vehicles enters the exclusion zone, indicating they are too close and may be in danger.

An effective workplace safety solution

- ✱ Detects and identifies safety risks on worksites before the become an issue or as soon as an incident occurs.

- ✱ Promptly alerts and informs the right people of accidents when they occur.

- ✱ Collects data and historical reports for analysis.

- ✱ Track people, vehicles and assets in real time above and below ground.

To make areas around heavy machinery safer, the utilisation of tags and facial recognition to ensure only the right personnel are in the area, and monitors and reports when workers enter or leave worksites. 365mesh's electronic Asset tracking devices tracks assets in real-time and monitors the usage statistics of vehicles. This provides companies with real-time visibility of their assets throughout the day, avoiding equip-ment loss, theft and ghost assets, and automating regular machinery maintenance.

Workplace Safety

Detect workplace incidents and alert before they happen

Man down detection & alerting (including slips & falls)

Workplace machinery exclusion zone monitoring and detection

Pedestrian vehicle/ machinery accident detection

Machinery/Vehicle safe distance monitoring and alerting

Collision detection and avoidance

PPE (Personal Protection Equipment monitoring, detection & identification)

Realtime electronic tags for unique identification (not wearing PPE)

Greenmesh can be utilised in many other industries

→ Healthcare and Aged care
→ Supermarket and Retail
→ Ocean and Marine
→ Airports

→ Railways
→ Transportation
→ Cold storage Logistics

Intelligent noise monitoring, identification and classification utilising advanced AI/ML capabilities

Real time camera surveillance with intelligent detection, directional pan, tilt and zoom capabilities

Track people, vehicles or assets above and below ground. 100% coverage of earth's surface, land and water

Air quality and hazardous gases detection and alerting with real-time weather monitoring at location

Electronic Asset tracking and theft detection

Create virtual fencing and boundaries and alert if an asset or person crosses that boundary

Detect accidents in real time and send alerts before they occur

Indoor and outdoor IP67 and IP68 certified for the use in high dust, wind and rain conditions

Realtime weather at location monitoring

Secure encrypted communications

Automated Detailed reporting

Image detection and identification

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