

Simoco Velocity IoT Platform set to Pave the way for Mining 4.0





Introduction

The mining industry is going through an era of digital transformation with the advent of advanced technologies like artificial intelligence (AI), robotics and the internet of things (IoT) to make cost efficiencies and to improve safety; always a paramount concern in this sector. In this white paper we look at some of the benefits this can bring, and how intelligent communications solutions like Velocity can play a leading role in enabling these improvements.

Challenge

The so-called Mining 4.0 revolution will see increased use of autonomous vehicles, predictive maintenance on machinery underground and on the surface to reduce outages and the use of real time data and analytics with machine learning (ML) to allow managers to make better decisions both in day-to-day operations, forward planning and in the event of a safety incident.

These changes will mean a dramatic shift in the level and sophistication of technology in an industry which, to date, has been largely reliant on two-way mobile radio as its main investment in critical communications. But a mine is not a place for taking a gamble on new technology and it's not the sort of operation you can shut down for few days while you upgrade to new systems. The improvements in safety and cost reductions that Mining 4.0 promises have to be delivered in an evolutionary manner. Harnessing existing technologies like mobile radio to extract live data from the mine will deliver tangible benefits at every stage of the journey.

Owing to the nature of mines, which present a hostile, ever changing environment, new technologies invariably rely on wireless communications. Running ethernet or fibre optic cable throughout a mine is clearly not always a practical option. And to date, the main wireless technology, two-way mobile radio, cannot offer the bandwidth that these new applications will require. Now, miners are not going to give up their mobile radios any time soon. What is needed is a solution that incorporates mobile radio while at the same time offering a pathway to advanced wireless-based applications with a range of connectivity options, both narrow band (as with mobile radio) and broadband, as with video, location mapping, real time data gathering and other smart technologies.

At the same time, this technology bridge to Mining 4.0 needs to be able to process data locally. Simoco's Velocity solution offers just such as bridge to the future with its multiple range of connectivity options and its onboard intelligence via an Edge computer, all in a compact robust form factor, designed for hostile, mission critical environments.

What benefits can digital mining deliver?

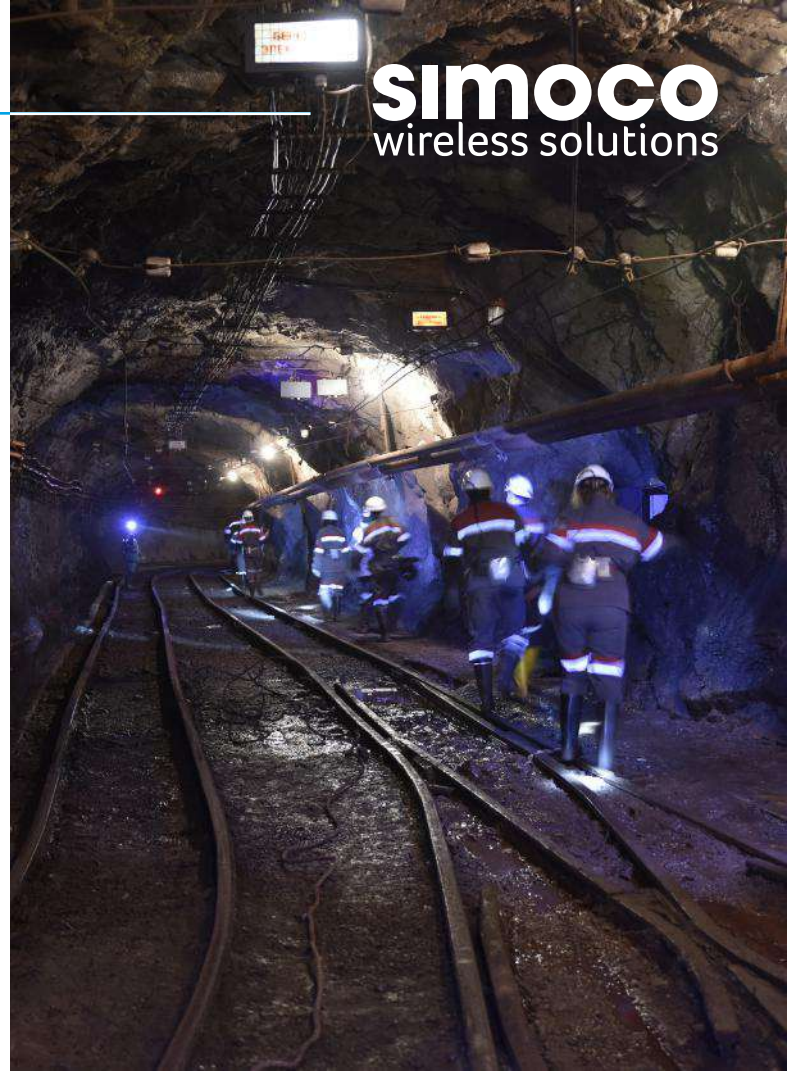
The so-called Fourth Industrial Revolution or Industry 4.0 has its counterpart in the mining sector where we talk about the "digital mine" or Mining 4.0. The range of technologies and applications is broad and encompasses everything from the use of augmented reality to creating digital twins of the mine to enable better planning and operational efficiencies.

Other applications are more immediate and down to earth with the growth of autonomous equipment and improved safety assurance. Despite this, mining has been slow to adopt innovative technologies, data published in BCG's Digital Acceleration Index (DAI) suggests that the mining sector is up to 40% less digitally mature than similar industries. However, when we look at the benefits that digital transformation can offer it is not hard to understand why attitudes are changing and Mining 4.0 is fast becoming a reality.

Improve safety and save lives

According to data published by the International Council on Mining & Minerals (ICMM) 43 fatalities occurred across ICMM members in 2021. ICMM's goal is to eradicate fatalities and injuries within the industry. IoT and digital transformation could be key to achieving this objective.

IoT adoption enables autonomous mining, removing the need for human operators and significantly reduces the risk of accidents as machinery is controlled from above ground or at a distance. IoT can also be implemented to streamline health and safety procedures, receive and process live weather reports and track movements of personnel while in the mine.



Streamline operations and improve efficiency

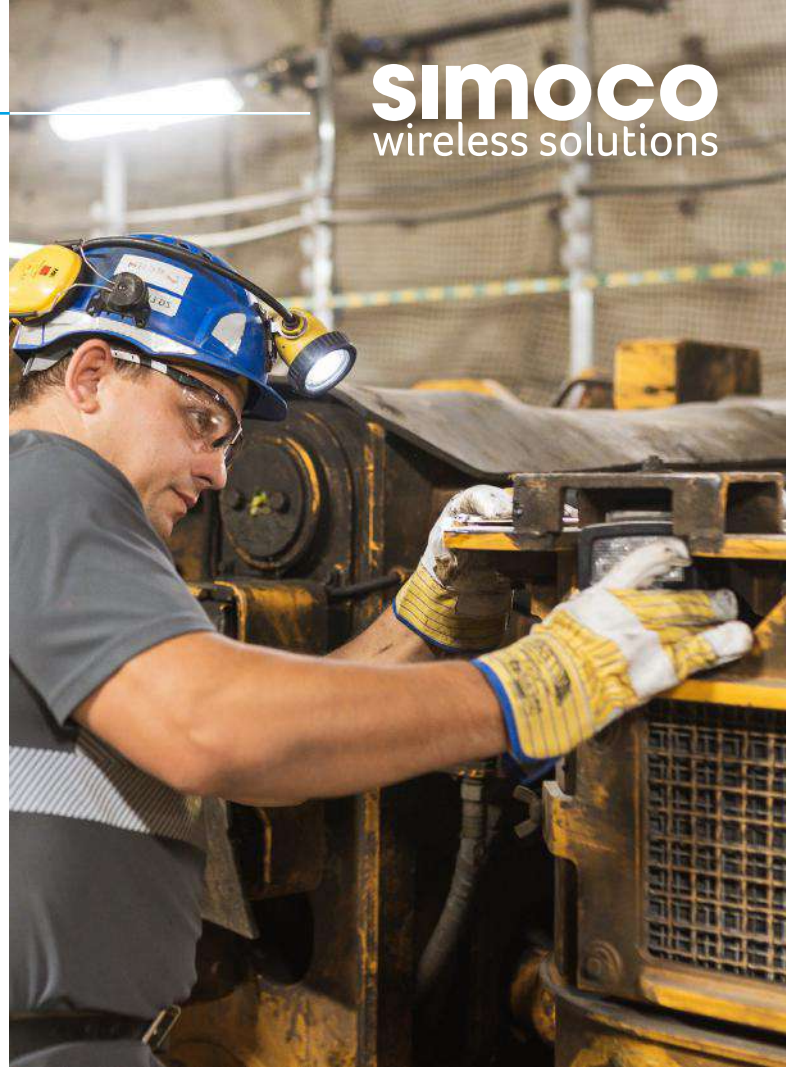
The increased use of autonomous equipment like haul trucks and drills, as well as offering a safety benefit means that mining companies can get better value from the huge investment they make in such machinery. As well as reducing the number of workers needed and all their ancillary costs like transport and housing, machines can work 24 hours a day without rest breaks.

Sensors within equipment enable mine operators to locate and track autonomous assets, using real-time data to optimise operations and productivity.

Real-time maintenance reduces down-time

Machinery, whether autonomous or not can be constantly monitored using low-cost wireless sensors so that the operations team can spot any potential maintenance issues before they arise.

By utilising these technologies, mine operators can identify trends within their equipment. This means preventative maintenance is carried out when it's actually needed rather than at routine intervals. This approach has the potential to reduce downtime, increase efficiency of machinery and individuals and significantly reduce costs.



Better information leads to better decisions

The digital mine will be capable of producing vast amounts of data from mapping to production processes and environmental monitoring. All of this needs to be gathered and analysed to improve processes, safety and compliance.

Advances using AI and ML mean that by using real time data it will be possible to design digital twins of the mine, a process or a workflow to improve operations or to predict potential interruptions to mining operations.

A smart step along the road to the digital mine

Arguably, the biggest challenge to smart mining is how data is extracted from below ground. Installing fibre optic or ethernet cables to establish an underground 4G or Wi-Fi network is hard to manage and has significant cost implications. There is also the issue of blind spots and reliability. Teams above ground need to be able to contact staff 24-hours a day, wherever they are in the mine. Simoco have found a solution to the problem. Its new leading technology, Velocity, combines traditional mobile radio with new mining 4.0 technologies to deliver powerful, insightful data.

As an industry, mining has been heavily reliant on mobile radio and has invested significant amounts in this technology over the years. It's easy to understand why; mobile radios work everywhere; they can transmit data no matter where individuals are underground and are a lifeline for miners. They are robust and stand up to the rough treatment they receive above and below ground. Miners and mine operators have faith in mobile radio; it's a familiar communication tool and easy to operate and, as a private network is largely immune to cyber-attacks. Using confined space engineering techniques like leaky feeder antennas they can be deployed throughout the mine and offer a secure, reliable signal wherever miners are located.

However, mobile radio is a narrowband technology, suitable for voice communication and very limited data applications like message alerts. It is not capable of handling higher bandwidth technologies like Wi-Fi, LTE or Bluetooth and has very little intelligence processing capability. As such mobile radio is not fully equipped to provide for the communications needs of Mining 4.0 but needs to be taken into account along the journey.



To bridge this gap and deliver the sort of capability needed for Mining 4.0, Simoco's Velocity platform offers an integrated single box solution that combines multiple connectivity options including mobile radio, LTE, Wi-Fi or Bluetooth and satellite. It can be used in tandem with any two-way radio solution to deliver data from the edge. Velocity can seamlessly switch between carriers while also offering the intelligence of an onboard Edge computer to provide the sort of local data processing needed for advanced Mining 4.0 applications. Its ability to accept data from a variety of sources using the most appropriate wireless carrier and then to process that data intelligently means that Velocity can make possible a wide variety of advanced applications and a stepping stone to the digital mining future.

For example, using its Node-RED intuitive programming tool, Velocity can be programmed with a definitive set of rules which can be implemented under predefined conditions. You could build a rule called 'gas above safe concentrations on level six' and, when activated, this would send an immediate emergency signal across the network to everyone located on that level of the mine to evacuate immediately. The message can be intelligently routed over any wireless device, including mobile radios, only to those mine workers concerned rather than shutting down the whole operation.

Another application scenario for surface mining or open cut operations could be the aggregation of meteorological data. Velocity can take a direct online feed and help to predict when adverse weather conditions like a thunderstorm might affect operations, allowing for a planned pause in operations, which improves productivity while also ensuring worker safety.

Velocity and its role in the Mining 4.0 future

As mining companies start to understand the benefits of digital transformation it is easy to see how Velocity can play an enabling role in the process, bringing the power of the combination of a multi carrier router and intelligent edge computing which could be deployed for a whole range of monitoring and reporting applications, from predictive maintenance on smart mining machinery to keeping an eye on temperature and air quality. The benefits of Mining 4.0 outlined in this white paper will require ever greater levels of data collection and communication over a variety of wireless bearer technologies while the application of intelligence to that data will result in cost efficiencies and process improvements that have hitherto been merely theoretical.



Contact Us

Field House
Uttoxeter Old Road
Derby
DE1 1NH
Tel: +44 (0) 1332 375 500
info@simocowireless.com

AUS HQ

1270 Ferntree Gully Rd
Scoresby, VIC 3179
Tel: +61 (0) 1300 363 607
Fax: +61 (0) 3 9730 3964
inquiry.aus@simocowireless.com

www.simocowirelessolutions.com

simoco
wireless solutions

UK HQ