Forging the mine of the future

Achieving safer, sustainable and more efficient mining operations with LTE/5G wireless networks

January 2022
Connectivity will help us realize the vision of the Smart Mine

With revenues in excess of USD 500 billion, the mining industry represents a major component of the global economy. But today, the mining industry finds itself at an important turning point. Rising demand for fuel and rare minerals needed for our technology is igniting expansion in the industry. Along with higher productivity, though, mining organizations are under pressure to achieve better safety, improve sustainability, lessen environmental impact and reduce operational costs.

Solving these multiple challenges is spurring the evolution to the “Smart Mine,” harnessing data, automation, autonomous machines and advanced technologies to achieve new efficiencies and capabilities. The realization of the vision of the Smart Mine, though, requires a strong foundation: ubiquitous mobile connectivity. Ericsson’s connectivity solutions for the mining industry have been enabling major productivity improvements and uncovering business value for both the mining industry and mobile telecom service providers.
New imperatives drive new thinking

The mining industry tends to be fairly conservative when it comes to adopting new methods and technologies. There have been few financial incentives to invest in new technologies, and regulatory frameworks governing mining operations often discourage such investments. A number of factors are coming together to motivate mining companies to seek new approaches.

Maximizing productivity
The main driving factor for investing in new technologies is the ever-present need to improve productivity in order to maximize the output of existing mine developments. Deployment of autonomous and remotely controlled machinery (haulers, drills, excavators) and optimizing mining processes through connecting different types of assets bring clear return on investment when it comes to new technology.

Creating a safer environment
Mining often involves placing workers into potentially hazardous environments. For example, stronger safety regulations along with the industry’s safety-first priority have reduced the annual fatality rate in the U.S. coal mining industry by 90 percent over the last four decades, according to data from the U.S. Department of Labor.¹

Controlling costs
Improving profitability in the mining industry requires working relentlessly on efficiency, transport and metal efficiency in extraction and transportation of ore. Incremental improvements are producing diminishing returns, however.

Regulatory and environmental concerns have also increased industry costs including recent regulations to protect the environment and prevent global warming. These regulations have imposed additional costs on the industry and forced it to pursue cost-cutting measures in other areas. Automation enabling profitability initiatives is the most promising area of opportunity for unearthing profitability.

Improving sustainability
Another major challenge for mining companies hinges on their ability to contain and reduce mining’s significant environmental and societal effects. The industry’s safety and environmental record is improving due to the increased adoption of technology. Connected workers, environmental modeling and autonomous operations let mine providers monitor mines and spot potentially dangerous situations early so they can be addressed before anyone is hurt. Automating their operations allows mining companies to increase sustainability by reducing fuel consumption and CO2 emissions.

Strengthening cybersecurity
In 2017, 54 percent of mining companies reported a significant cybersecurity incident, according to EY Global Information Security Survey 2018–19. Four years later, the EY Global Information Security Survey 2021 declared that the pandemic released a “perfect storm” of cyberthreats. As their operations become more digitized, mining management teams must bolster their cybersecurity to protect their sensitive data and critical operations.

54%

of mining companies reported a significant cybersecurity incident, according to EY Global Information Security Survey 2018–19.

Mining 4.0: Defining the future of the industry

Only by entering the new digital age can mining companies respond to their key challenges and map out a successful future. Whether to cut costs or get more ore from existing mines, mining companies are already adopting new ways to extract, transport and process materials. They’re partnering with original equipment manufacturers (OEMs) to implement digital technology such as autonomous haulers, load-haul-dump vehicles and drill rigs to improve costs, enhance safety and improve sustainability.

All of these advances depend on mobile wireless connectivity in a challenging environment. Private wireless networks allow for secure remote operations, autonomous and connective vehicles, connected workers and predictive maintenance. In practice, mobile connectivity has proven robust enough to deploy in the harsh mining environment without causing interruptions in ore production.

How to communicate through rock

Rock is the bread-and-butter of mining, but it’s the nemesis of communications. GPS and cellular signals are obstructed by the concrete, mineral water and coal in a mine. With older technology, to send a cellular signal through a tunnel that runs for miles, you’d have to place wireless receivers in a relay at each bend or turn, a very expensive undertaking. That’s why until recently, mining companies were relying on Wi-Fi and mesh peer-to-peer and leaky feeder networks for critical communications inside mines and VHF comms for voice. While Wi-Fi and mesh networks can meet some needs, they have limitations, from reliability to security to latency, that hamper digital transformation. Wi-Fi 6 offers improved throughput and lower latencies to compete with cellular signals, but more radios would be needed to guarantee the same bandwidth availability. And Wi-Fi Quality of Service (QoS) is not up to the needed standards. Leaky feeders have worked for places like the ramp and general mine infrastructure, but moving into the levels and the mine’s new development areas, coverage dropped significantly and workers could not be reached.

For a fully autonomous, remotely controlled smart mine, high-performance communications are needed. Secure, flexible and future-proof, a state-of-the-art private LTE/5G network is ideal for underground mines.

Communications: Underground vs open-pit mines

Underground tunnels set special challenges for the creation of seamless communications. Coverage can be implemented with small cells and directional antennas or with leaky feeder cables. Leaky feeder cables design is optimized for mining tunnels and traffic profiles for mining applications, but they have coverage limitations. Private networks improve coverage and performance in underground mines, ensuring connectivity for remote controlled operations and autonomous vehicles. Furthermore, providing data and voice mobility services over low frequency bands (utilizing band 5 at 850MHz) in underground mines provides better propagation than any other available technology, delivering faster, more advanced wireless technology.

Private networks require spectrum to operate in underground mines. However, it is country dependent. In Canada for example, spectrum licenses are not needed for underground mines. Open-pit is one of the most common mining methods. Private networks provide strong coverage, high throughput, and low latency in wide areas to monitor autonomous trucks across in open-pit mines. Private networks also benefit open-pit mines with a suite of connected devices such as smart PPE, site sentinels, AR/VR, and safety beacons, ensuring worker safety. Open-pit mines require spectrum to operate private networks. Spectrum can be licensed, unlicensed or lightly licensed.

Advantages of a private LTE/5G network:

• High bandwidth, low latency
• Supports important use cases—voice, mission-critical push-to-talk (MC-PTT), autonomous machines, remote control, predictive maintenance, environmental sensing.
• Open ecosystem lets companies avoid vendor-lock.
• Reliable and predictable performance
• Cost-efficient—requiring a factor of 10 fewer communication nodes to cover the same area compared to Wi-Fi.
• Rich device ecosystem gives companies more choices for communications.
• End-to-end security, using SIMs, on both network and device levels. Wi-Fi standard only covers L1-L2 security.

Become an ecosystem partner with Ericsson.

Partnerships and new ecosystems are key to unlocking the full value of Mining 4.0. Working with service providers, system integrators, software and application developers, chipset and device vendors, gateway suppliers, cloud providers and various standards organizations, Ericsson is bridging the gap between the devices and the applications. Becoming an ecosystem partner helps you to unlock new business, grow your business, earn certification and gain valuable access to new customers.
Connecting the smart mine

Only robust wireless connectivity can handle the huge amounts of data and voice communications that are mission-critical to smart mining. A 5G-ready private cellular network introduces the high-speed connectivity, low latency and strong performance—optimized for the Internet of Things (IoT)—required in a mine’s high device density environment.

Ericsson’s broad portfolio for private networks, including the most extensive radio portfolio of any major Tier-1 vendor, can help meet mining companies’ diverse wireless networking needs. Ericsson has the global experience and references to provide proven technology that can easily be deployed by mining enterprises. In addition, mining companies can test and readily utilize 5G technologies with Ericsson’s cost-effective software-only, upgradable solutions.

Private network solutions from Ericsson

Ericsson’s Private Networks portfolio is Plug and Play. Our solution has options ranging from as low as 100 user licenses, consisting of Small Core, to 25k users, called Large Core. Ericsson’s Radio System portfolio comes in a range of sizes. Radios the size of smoke detectors can accommodate small indoor building spaces. Our medium-sized radios, called micro radios, are ideal for average to medium applications. Our macro radios can cover a reasonably large area (such as a small city or open-air mine), with a moderate amount of subscriber density. Ericsson Private 5G, available soon, will bring high-quality, fast and secure connectivity into potentially hazardous environments, allowing mines to mobilize efficiency and safety—improving use cases.

Reference cases

Our 5G-ready private networks have been successfully deployed by mining companies around the world. Here is a selection of customer successes.

Boliden Aitik mine research project

Ericsson, mining giant Boliden and other partners collaborated to co-create the mine of the future at Aitik. Ericsson high performance mobile communications enabled Boliden to automate drill rig operation. Automation saved approximately one percent of Aitik’s total annual costs and eliminated the need for two more drill rigs. The next step in the rollout is fully automated / remotely controlled trucks that will deliver smoother transport flow and lower fuel consumption and emissions.

Aginco Eagle

Ericsson and Canadian-based Ambra partnered last year to deliver the world’s deepest underground LTE network for the Agnico Eagle mining complex, LaRonde, in Abitibi, Quebec. Located 3.5 kilometers below the surface, the 4G LTE private network provides data and voice services across the LaRonde mine site and enables several Internet of Things (IoT) use cases to improve safety and mining operations. The benefits of installing a private 4G LTE network included real-time communications across the mine, a safer workplace, more efficient operational activities and more sustainable mining.

Newcrest

Ericsson provided Australian mining leader Newcrest with a tailored platform using Ericsson Private LTE. The network will underpin Newcrest’s safety and digital mining ambitions and will help improve productivity and deliver new value and efficiencies to the business. Ericsson provided Newcrest with a tailored platform using Private LTE that will help its safety and digital mining ambitions, improve productivity and deliver new value and efficiencies to the business. View case

Choose an Ericsson 5G-ready private network to get:

Best-in-class RAN portfolio with remote radio units (RRUs) separated from Baseband:
- all-in-one dual-mode core (LTE and 5G NSA)
- software (SW) upgrade to 5G SA
- easy RRU deployment with only fiber and power
- low power consumption allowing for lightweight micro radios
- active / active configuration for redundancy
- SW upgrade to 5G

Proven and flexible Core network with add-on services:
- all-in-one dual-mode core (LTE and 5G NSA)
- SW upgrade to 5G SA
- flexible deployment with add-on VoLTE and MCPTT
- fully redundant configuration
- proven globally, radio-agnostic

“You can imagine—video surveillance, man down detection, localization of machines, vehicles, things and people. For sure, there will be a lot of use cases we haven’t thought about. Once you have 5G in place, innovation will happen.”

— Peter de Bruin, Master Researcher, Ericsson Research
Why choose Ericsson wireless solutions?

For mining companies, smart mining powered by Ericsson private networks promises to deliver a substantial triple bottom line that includes improved safety for workers and more responsible environmental impact along with major efficiency and financial benefits. For telecom service providers, Ericsson 5G-ready wireless technology can provide a foothold in a growing industry segment.

Ericsson is leading the way in the specialized world of connectivity for mining. Our market-leading 4G and 5G solutions are based on 3GPP (formal standards) that aligns with large ecosystem players among device manufacturers. By utilizing the same radio and baseband portfolio that the larger providers do, our Private Network Portfolio enables a broad reach that can help fit solutions to the needs of larger multinational mining companies. Our ecosystem includes a wide range of industrial partners, enabling us to address our mining customers’ unique issues. With extensive relationships with many of the world’s service providers, we can easily facilitate hybrid solution offerings in partnership with local providers.

How can we help you?
Bringing about change is never simple. But the advances of automation enabled by private networks have the potential to solve many of the mining industry’s ongoing challenges—and even shape the future of the industry.

Find out more about wireless connectivity for the mining industry and let us help you on your digitalization journey.

Visit our website. www.ericsson/mining
Ericsson enables communications service providers to capture the full value of connectivity. The company’s portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson’s investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

www.ericsson.com