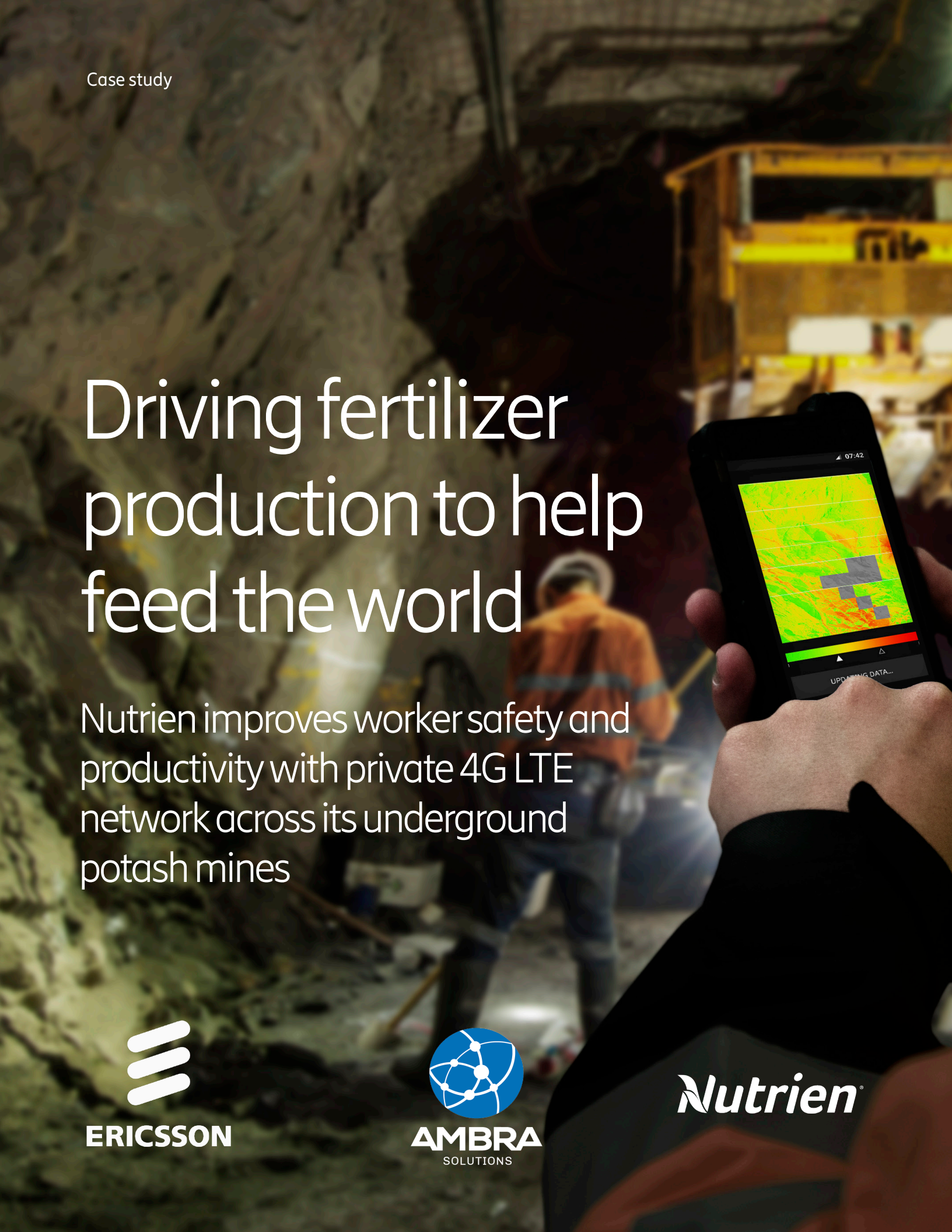
Case study

Driving fertilizer production to help feed the world

Nutrien improves worker safety and productivity with private 4G LTE network across its underground potash mines



ERICSSON

AMBRA SOLUTIONS

Nutrien

Reliable voice and data connectivity 1,000 meters underground

Case study:
Nutrien

Industry:
Agribusiness

Executive summary

As a principal supplier of fertilizer to drive global food production, Nutrien is continually looking for innovative ways to improve the safety and efficiency of its operations. To support that objective, the company needed better voice and data communications for its underground potash mines than provided by its previous analog phone system and sporadic Wi-Fi network. Working with telecommunication network consulting firm, Ambra Solutions, and leveraging radio technology from Ericsson, Nutrien deployed a private 4G LTE network (with future plans for 5G) across its 500 square kilometer Canadian Potash mine in Rocanville—the first of its kind in the agricultural industry—and is rolling out the wireless network to its other five mines across the province of Saskatchewan. With the LTE network, the company has improved the safety of mine workers with accurate location tracking and reliable voice communication. Additionally, the company is enabling higher productivity by reducing equipment downtime and streamlining data communication, eliminating manual paper logbooks and saving hours of underground driving to find available Wi-Fi connections. The result is helping the company achieve its increased production goals while driving more efficient mine operations.

At-a-glance

Goal:
Ensure worker safety and increase productivity for underground potash mining operations by improving voice and data communications within the mine and to the control center

Approach:
- Partner with Ambra Solutions to design and deliver an innovative underground private 4G LTE network
- Leverage Ericsson radio technology for reliable wireless communication in harsh mine conditions
- Explore the use of tracking beacons to maximize accuracy of locating people and equipment in mine tunnels

Results:
- Delivered high-speed data and voice connectivity through hundreds of kilometers of underground travel ways
- Improved the safety and efficiency of mine workers, supporting higher productivity
- Reduced time to deliver critical mine information to the control room from hours to seconds
- Enabled deployment of new mobile apps such as push-to-talk
- Provided backbone for IoT solutions such as predictive maintenance and intelligent ventilation

Communicating across hundreds of kilometers underground

The mission of agribusiness giant, Nutrien, is to play a significant role in solving world hunger. As a leading producer of fertilizers, the company is focused on helping farmers grow more food to feed the world's constantly expanding population. To achieve this objective, Nutrien is focused on increasing production of the core ingredients that comprise modern fertilizers—nitrogen, phosphate, and potassium (potash), otherwise referred to by their scientific symbols, N, P, and K respectively.

In fact, Nutrien operates some of the largest potash mines in the world. Each mine can be 500 square kilometers in size, with dozens of tunnels running the length and width, 1,000 meters underground. Running those mine operations efficiently is the key to boosting production and keeping workers safe.

Justin Stade, Nutrien's director of NPK digital transformation, explains, "Having a mine that is essentially the size of a city, communication is essential to know where people and equipment are at all times to ensure safety. Also getting operational and maintenance information to the control room is critical for decision-making that can affect productivity."

However, communicating efficiently between underground operations and the control room proved difficult. Nutrien relied primarily on a wired analog phone system in the mines, with a handful of Wi-Fi access points in some locations. The most critical information on potential hazards, equipment conditions, and maintenance needs or mine operational status was shared using a paper logbook distributed to all the mining faces (the part of a mine where work is advancing).

Chad Skiba, IT manager for potash at Nutrien, says, "Most of the data transmitted to the control room required traveling underground to the nearest Wi-Fi access point, which could be kilometers away. Or someone would have to physically carry relevant pages copied from the logbook up to the surface where the information was manually transposed into the appropriate application. Expanding Wi-Fi would be way too costly so we started looking at other, more cost-effective ways to improve connectivity and communications in the mines."

Connecting people and equipment with private 4G LTE

Nutrien's search for better underground communications led them to Ambra Solutions, a leading provider of mission-critical telecommunication network solutions. Ambra not only had the technical capabilities to address Nutrien's needs, the company also brought extensive knowledge specific to underground mining operations.

Ambra proposed a private 4G LTE wireless network that would span the underground mines from end to end. Ambra worked with the Nutrien team to analyze tunnel conditions and their communication requirements, and then conducted extensive testing to detemine the best approach. One of the main challenges was the consistency of potash—the common term for a mineral and chemical compound containing potassium—and the unique shape of potash mine tunnels, which tend to be low and wide.

Eric L'Heureux, Ambra's president and CEO, explains, "It is very challenging to propagate a radio signal in a low-ceiling tunnel made of soft rock like potash. Adding to the challenge, power is only available at tunnel intersections in a few parts of the mine. We had to perform a number of experiments in the field and use our propagation model to find the best locations for the radio antennas."

The effort paid off. Today, Nutrien has fully deployed a private LTE network in its Rocanville Potash mine—the first of its kind in the agricultural industry. The company is also rolling out the wireless network to its other five mines across Saskatchewan.

"Another great thing about Ericsson equipment is the ability to build redundancy into the infrastructure, so we have resiliency to maintain communication even if there is a component failure somewhere in the network."

— Chad Skiba, IT Manager for Potash, Nutrien

Ensuring reliable wireless performance in harsh mine conditions

Nutrien's underground LTE network is built around Ericsson radio base stations, which include the radio, antenna, and GPS function in a single cabinet. The solution also includes Ambra's proprietary software and tracking intelligence, providing a complete voice and data communication solution.

To cover the maximum area underground, each cabinet is strategically deployed at underground intersections where multiple tunnels meet. Tracking beacons are also employed to ensure accuracy for locating people and equipment in the tunnels. Compared to Wi-Fi, the LTE network delivers far greater wireless performance over greater distances. For example in tests, Wi-Fi could maintain just 8 Mb/s for approximately 300 meters while LTE supported 21 Mb/s for 1.3 kilometers in the tunnels. Moreover, LTE provides this coverage at a fraction of what Wi-Fi would cost.

Chad points out that Ericsson radio technology, recommended by Ambra, was the right choice given the hot and dusty conditions in the mines. "We knew Ericsson provided carrier-grade equipment in our public LTE sector and that the technology is built to operate reliably in very harsh conditions. Another great thing about Ericsson equipment is the ability to build redundancy into the infrastructure, so we have resiliency to maintain communication even if there is a component failure somewhere in the network."

Eric adds that the flexibility of Ericsson technology is another valuable advantage. "Ericsson makes it very easy for us to reconfigure the system if we need to change the topology or expand the network. If 5G is needed in the future, Nutrien can just activate the license without replacing hardware. There's really nothing that prevents us from making changes in the LTE network as Nutrien's needs evolve."

"Ericsson makes it very easy for us to reconfigure the system if we need to change the topology or expand the network. There's really nothing that prevents us from making changes in the LTE network as Nutrien's needs evolve."

— Eric L'Heureux, President and CEO, Ambra Solutions

Reliable communication proves key to safety and productivity

With hundreds of people working in its mines on any given day, Nutrien's top priority is always safety. And a safe environment is also a productive environment. Since deploying the private 4G LTE network, underground workers now have readily available communication throughout the mine and with the control room.

In addition to people, Nutrien's mines are filled with kilometers of conveyors that move mined potash to the surface, as well as vehicles (including a growing number of electric vehicles) and other mining equipment. Workers can now open up a manual or standard operating procedure for a piece of equipment on their smartphones. If a problem arises with the equipment, someone can simply take a smartphone picture and send it instantly to maintenance rather than getting in a vehicle and driving hours to report the issue. And with new mobile apps, like push-to-talk, voice communication with supervisors or the control room is now instantaneous from anywhere in the mine, again saving hours getting to the nearest phone.

Justin remarks, "Without the LTE backbone, we would have no viable way to deploy mobile apps. The network is really the foundation for everything we want to do to improve safety, efficiency, and productivity as we move towards our Next Generation Potash future."

Paper logbooks are also becoming a thing of the past. Using tablets, workers at the mine faces can now submit important information to the control room digitally, which is often critical for minimizing production delays or equipment downtime. Justin points out, "They aren't waiting hours or days to get that information; it's in seconds. When you consider the control room is orchestrating numerous mining machines across a city-size mine, we're looking at a big productivity gain."

Wireless foundation for a world of possibilities

The LTE network is also creating opportunities for Nutrien to pursue additional initiatives in the mines. The company is now exploring how to leverage wireless connectivity and location information to track the movement of vehicles, equipment, tools, and other assets throughout the mines.

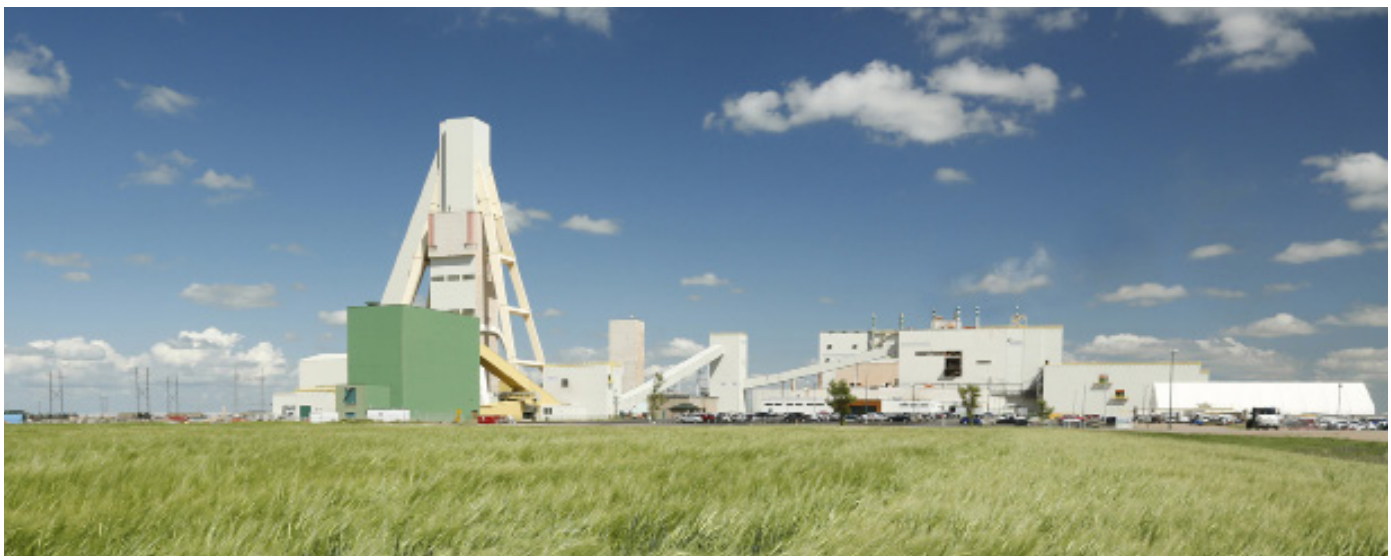
Chad notes, "Tracking is especially important for safety, to know where everybody is in the event of an emergency."

Advancing toward the ultimate goal of creating a connected mine, Nutrien is beginning to deploy Internet of Things (IoT) sensors on vehicles, equipment, and systems like ventilation. Combining sensor data with analytics and machine learning, the company will be able to get predictive maintenance intelligence to avoid production downtime and further improve safety, productivity, and environmental quality.

With sensors on its mine ventilation fans, for example, Nutrien can get real-time intelligence on air flow and how much particulate matter is being emitted into the mine atmosphere. This will enable managers in the control room to make more-informed decisions on how to reduce those emissions and ensure a healthy working environment for the people underground.

"Without the LTE backbone, we would have no viable way to deploy mobile apps. The network is really the foundation for everything we want to do to improve safety, efficiency, and productivity as we move towards our Next Generation Potash future."

— Justin Stade, Director of NPK Digital Transformation, Nutrien

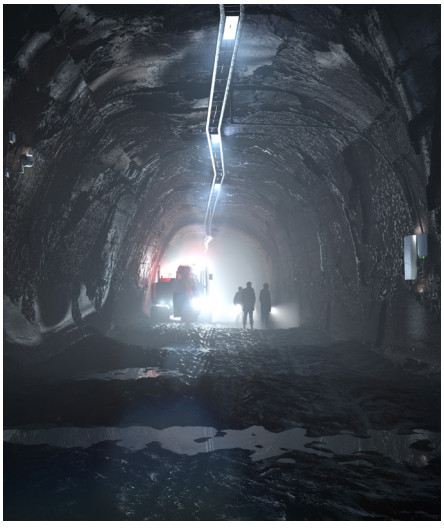


Justin says, "What we're aiming for is a connected mine where we have real-time information that allows our experts to make better decisions, faster, and with more confidence. Nutrien has charted a road to significantly increase our potash production to meet the world's food needs, and this LTE and IoT technology will help us get there."

He concludes, "Global food production is at a scary precipice right now. Being able to provide more fertilizer globally to help growers maximize food production from the finite amount of arable land, Nutrien is playing a vital role in helping to feed the world and create a brighter future."

"Nutrien has charted a road to significantly increase our potash production to meet the world's food needs, and this LTE and IoT technology will allow us to get there."

— Justin Stade, Director of NPK Digital Transformation, Nutrien



Solution Highlights

Ensuring worker safety while driving higher productivity in underground potash mining
Nutrien is driving higher potash production to help grow more food for the world's expanding population by improving safety and efficiency in its underground mines, providing reliable end-to-end wireless connectivity to track people and equipment and deliver real-time mining data to control room experts for faster, better-informed decision making.

Transformational solution
- The world's first underground private 4G LTE network for agribusiness

Ericsson hardware
- Radio Access Network (RAN)
  - BaseBand 6502 and RRU 2203 B2/B25 (micro sites)
  - BaseBand 6630 and RRU 4402 B2 and RRU 4415 B2/B25 (macro sites)

Ericsson software
- LTE Radio Access Network
- Massive IoT (LTE-M/NB IoT)
- Upgradable to 5G NR

Ambra software
- Ambra Intelligent Tracking System (IPS)
- Ambra monitoring system

Ambra services
- Engineering
- 24/7 support
- Licensed Spectrum
- SIM cards

Solution advantages
- High bandwidth, low latency
- Supports voice, data, push-to-talk, predictive maintenance, environmental sensing
- Open ecosystem avoids 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 provides more choices for communications
- End-to-end security, using SIMs, on both network and device levels (Wi-Fi standard only covers L1-L2 security)

About Nutrien

Nutrien is the world's largest provider of crop inputs and services, playing a critical role in helping growers increase food production in a sustainable manner. The company produces and distributes approximately 27 million tons of potash, nitrogen, and phosphate products worldwide. With this capability and its leading agriculture retail network, Nutrien is well positioned to supply the needs of its customers while addressing economic, environmental, and social priorities. The scale and diversity of Nutrien's integrated portfolio provides a stable earnings base, multiple avenues for growth, and the opportunity to return capital to shareholders.

About Ambra Solutions

Since its incorporation in 2007, Ambra Solutions has developed its expertise in the field of telecommunications engineering, including the design and manufacture of robust, reliable, and durable products to meet the specific needs of many customers in the industrial sector. Several Ambra LTE networks have been successfully deployed by major players in the mining industry. Today, the company's multidisciplinary team consists of highly qualified engineers and experienced technicians who provide reliable solutions and technical support around the world.

About Ericsson

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 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

The content of this document is subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

www.ericsson.com

SE-126 25 Stockholm, Sweden
Telephone +46 10 719 00 00

© Ericsson 2022

November 2022, Rev. 1