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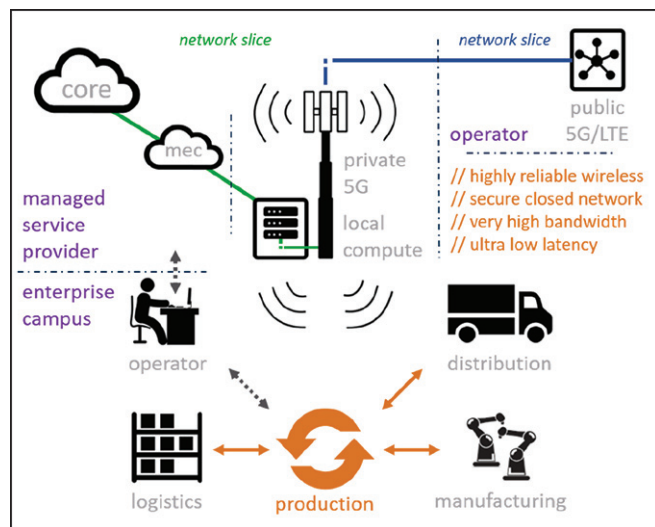
Industry Directions™

Private LTE Network in Mines and Oil Fields: The Status of Progress and Adoption

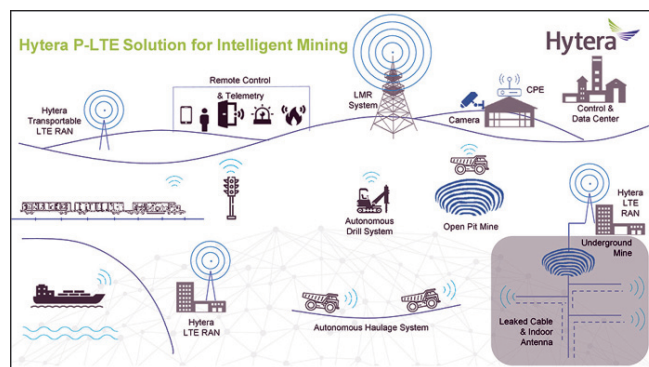
Keeping mines efficient requires a highly reliable, accessible, secure and high-performance communications network. The existing Wi-Fi, 2G, 3G, proprietary VHF and PMR options are not keeping pace with mining information interchange demands of all types.

One solution is private, ultra-broadband LTE for mining: delivering ultra broadband in the middle of nowhere. Indeed, the reason for the title is somewhat obvious in that mines tend to be in not just remote but very remote locations. Private LTE is a local LTE network utilizing dedicated radio

equipment to service an area making it independent of fluctuations in a wide-area network. The deployment focuses on digitization, predictive and prescriptive analytics and robotics connected through low latency and secure LTE technology to maximize efficiency and productivity, Nokia said. According to a report by ABI Research, private wireless networking market opportunity is estimated to be worth over US\$16 billion by 2025.



Private LTE Architecture



Private LTE scope in mines

The Benefits of Private LTE

What are the benefits compared to traditional Wi-Fi or public LTE?

There are many:

1. Privacy

With Private LTE (versus public), data never leaves the

enterprise customers' network. This is especially important for highly regulated industries.

2. Security

SIM-level device security ensures that devices have a unique identifier and are properly authenticated. This gives network administrators tight control over what devices are allowed on the network. Much simpler than dealing with complex Wi-Fi authentication processes.

3. Flexibility

Private LTE networks can be customized to meet an organization's unique application needs. This is important when you compare to app connectivity and dealing with handoff between Wi-Fi access points.

4. Capacity

Private LTE networks can use either dedicated or shared spectrum. This puts the enterprise customer in control of bandwidth and infrastructure density, based on their individual needs.

5. Quality of service (QoS)

Cellular technology provides a better quality of service than Wi-Fi and gives the customer control of how data traffic is prioritized, end to end.

6. Latency

Deterministic latency - i.e. the ability to set a fixed length of time for the transfer of data - is available with Private LTE, thanks to full end-to-end control. Deterministic latency can be very important in factory settings where devices need to be tightly synchronized.

7. Resiliency

With Private LTE, enterprise customers can deploy additional small cells for increased resiliency and uptime. They can also allow fallback to public LTE (if desired) using the same cellular device.

8. Mobility

With Private LTE, mobility, that is, the hand-over between the individual small cells, is seamless and comparable to what users experience with public LTE. There's no connection loss with Private LTE as there can be with Wi-Fi.

9. Cost

Enterprise customers enjoy lower data transfer costs with Private LTE than with public LTE, an especially important consideration when there are high data volumes. In addition, while the cost of an individual high-powered small cell is higher than an enterprise-grade Wi-Fi access point, fewer small cells are needed to provide coverage over the same area.

10. Simple to deploy

There are major third-party players in the Private LTE space that provide the A-to-Z services needed to setup these networks.

11. Simple to support

No more dealing with Wi-Fi related connection issues. A

SIM card and IMEI are locked together and assigned to a device. That's all.

12. The Buildout

One of the most important benefits is how Private LTE is built out. Whereas Wi-Fi must be installed close by, locally section by section in your facility (where line-of-site is important), many LTE radios can be deployed around your facility and point inwards (depending on layout).

A facility that requires 500+ Wi-Fi access points can get the same or better network coverage with roughly 20 LTE radios (again, depending on layout). It is clear that Private LTE allows to simplify wireless network, decrease complexity in how devices connect and are supported, and ultimately provide a better quality of service for end users.

Zinkgruvan Mining

On July 2021 Zinkgruvan Mine, Sweden got its own private cellular network from Telia, powered by Athonet's 4G and 5G Core. The mine has a turnover SEK 2 billion per year, mines minerals and produces metals that are necessary for the development of modern society. The business consists of an enrichment plant and a mine and is driven forward by 420 employees. Zinkgruvan Mining is part of the international group Lundin Mining, which has 4,500 employees and operations on three continents. The underground mine has 48 kilometres of transport routes and tunnels are now fully self-sufficient to a depth of 1300 metres, independent of Telia's regular network, functionality and technology above ground. Telia has supplied a customised mobile network to Zinkgruvan Mining, which extends over 48 kilometers of transport routes and tunnels down to a depth of 1300 metres. The mobile network has been designed for very high performance, reliability and accessibility and is a platform for digitalisation and streamlining of Zinkgruvan Mining's operations.

Oil and Gas Companies

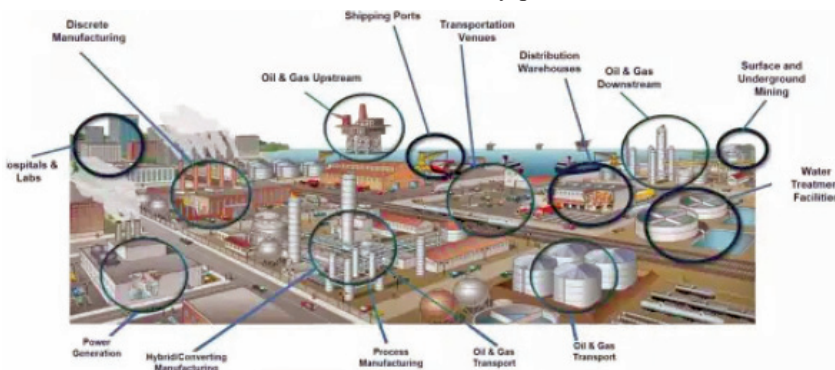
An estimated 40% of mature onshore oil and gas sites have poor wireless connectivity, "covered by outdated technology that experiences significant reliability and bandwidth issues." In a 2020 poll conducted by PwC, "2020 Digital Operations study for energy: Oil and gas," oil and gas executives were polled on the topic of the barriers standing in the way of a successful digital transformation in their industry. The technology itself was of little concern. The top items getting in the way were:

- Limited knowledge sharing (77%)
- Insufficient digital training (74%)
- Lack of digital talent (72%)
- Insufficient customer/user focus (70%)
- Insufficient collaboration (70%)



Private LTE Network market could reach \$31B by 2022

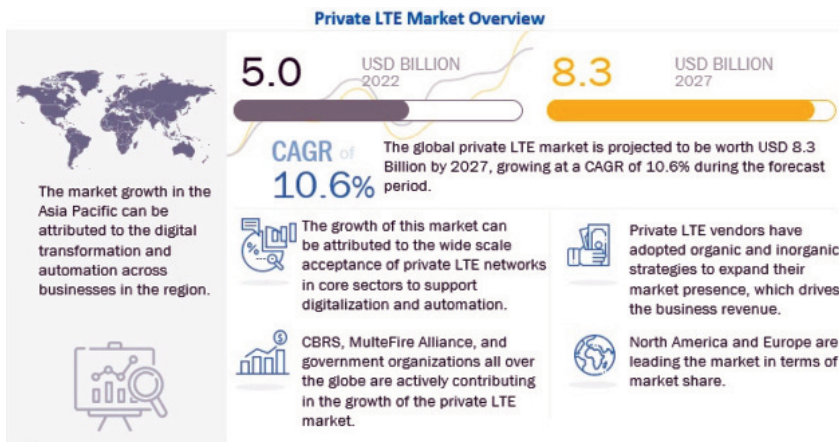
Wide area of industries addressable by private LTE networks



A Chief Data Officer from an independent E&P (Exploration and Production) firm said, “The main challenges are not related to technology but rather to organizational shortcomings, primarily in change management and in technology adoption.” “Private LTE is fantastic because we can arrive at an oil and gas company’s job site, put up temporary towers, and control bandwidth and who’s using it – all while harnessing the same technology that the carriers use,” one said. Nokia Digital Automation Cloud (DAC) is an integrated plug-and-play, as-a-service private wireless offering that provides an easy-to-use industrial-grade private wireless network. A variety of radios (including for CBRS spectrum) deliver the connectivity, locally deployed edge cloud server, and core network necessary for low-latency applications and local breakout – helping keep enterprise data confidential and the network management accessible via an intuitive web GUI in the cloud.

The Future

To transform the resources industry, networks need to be reliable, powerful and secure. LTE private networks can deliver what the industry needs right now while laying the foundation for a seamless transition to 5G and beyond, giving IT and OT managers a single network that’s easier to manage than several disparate technologies. And it will result in value creation – the use of advanced connectivity to optimize oil and gas drilling and production throughput and improve maintenance and field operations that could eventually add up to \$250 billion of value for oil and gas upstream operations by 2030, according to McKinsey.



Source: MarketsandMarkets Analysis