

Affordable 5G Foundations for More Profitable Mining

Solution Brief :
Private 5G Network-Smart Mining

ADLINK
LEADING EDGE COMPUTING

intel partner Titanium

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Overview



Affordable 5G Foundations for More Profitable Mining

Done right, 5G deployment could yield a net reduction in total costs, address gaping loopholes in enterprise management, and deliver the output leap management required.

Miners learned a hard lesson from the U.S. shale boom and bust of the prior decade: Overinvestment in infrastructure is a far greater risk than continuing to realize profits from high commodity prices, then putting those profits into share buybacks. Miners don't want massive, long-term commitments to new mines, especially in an environment of macroeconomic volatility and uncertainty. They want ways to hold capital expenditure budgets steady and obtain more value from existing operations.

At the same time, the world desperately needs more resources. The transition to electric transportation alone requires mass quantities of lithium, cobalt, nickel, and graphite. Needs for hydrogen and uranium are rocketing upward alongside new demand for oil and natural gas as energy scarcity rises and shows signs of long-term persistence. Rising populations mean rising resource demand, but balancing supply against that demand is essential to keep commodity prices at manageable levels.

In short, miners face similar issues as every other business in turbulent times. They must do more tomorrow with the same or less budget than they had yesterday. Fortunately, 5G wireless communications can help enable this leap in efficiency through a variety of channels, including lowering labor expenses while improving operational security.

In China's Sichuan Province, in the shadow of Mount Emei, an open pit mine operator typically extracts roughly 4 million tons of limestone annually. The company uses legacy methods and practices first implemented in the 20th century, with largely manual systems leading to approximate weighings, frequent miscalculations, unnecessary waste, and a wide array of similar inefficiencies. The company set a new output target of 8 million tons per year, essentially doubling production, without opening any new mines or significantly adding staff. Instead, the mining firm retrofit the entire company with 5G.

Updating connectivity is about much more than having faster wireless speeds. 5G infrastructure allows companies to deploy everything from powerful servers to isolated sensors into any environment. The networking of this "Internet of Things" (IoT) via 5G technology provides a path to unprecedented data collection and automation. By updating its mines and offices to 5G, this limestone mining company could finally engage in data mining and analytics across its operations. It could achieve real-time monitoring of a host of output metrics and fully automate its weighbridge equipment. It could leverage artificial intelligence (AI) to help optimize processes from mine shafts to sales offices.

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Challenges

Wireless Communication Is Needed

Prior to its 5G upgrade, the limestone miner suffered a range of difficulties. At best, the open pit area had a poor wireless signal. In many places, there was no signal at all. Laying wired connections over such broad distances was either physically infeasible or cost prohibitive. With no usable network throughout the site, real-time management was impossible. Small issues that could be easily remedied with centralized supervision went unchecked and were magnified into larger problems.

Without proper networking, safety and monitoring proved very difficult. Wired CCTV systems could only be installed over a relatively short range. Wireless options tended to be proprietary, costly, and qualitatively inferior to mainstream, 5G-based alternatives. And because the company lacked 5G infrastructure, installing 5G monitoring solutions was impossible. In many markets around the world, such monitoring deficiencies would result in compliance breaches, fines, and potentially lawsuits.

The mining company also faced numerous challenges stemming from its legacy weighbridge. Requiring on-site staff to weigh trucks incurred labor costs and introduced the possibility for human error ranging from accidentally recording the wrong value to accepting bribes for skimming of mined materials. Manual weighbridges also require operators and drivers to interact, which can introduce many types of delays. (weigh staff may be on a call, engage in idle conversation with drivers, and so on.) Not least of all, if a mine's policy is to only hire weigh staff to work during "business hours," then a manual weighbridge effectively restricts weighing operations to those hours regardless of whether materials processing and transportation continues into the night, thus bottlenecking productivity.



Application



5G Smart Mining

ADLINK partnered with 5G core and 5G physical layer full stack technology products provider, InnoGence, to deploy the 5G smart mining in Emei, China.

Solutions

The 5G RAN Creates a Wireless Infrastructure Solution for The Limestone Mining

ADLINK teamed with 5G radio access network (RAN) provider Innogence Technology to create a wireless infrastructure solution for the limestone mining client. Specifically, Innogence supplied three critical 5G elements.

Picocell. In areas where tall towers do not or cannot provide adequate 5G wireless coverage, picocells provide coverage density. These small, affordable devices offer high performance to an indoor or outdoor coverage diameter of roughly 200 meters. With support for optical fiber and Power-over-Ethernet (PoE) connections, Innogence's RU5001 picocells install quickly with very little cabling. Features including flexible cell integration and splitting, software-based expansion, and head end-centric monitoring and management make the RU5001 a powerful yet convenient coverage option for medium- to large-scale installations.

Gateway. The Innogence 3-5002 industrial gateway provides a nexus for those RU5001 picocells, helping bridge them to the larger network backbone. With two Gigabit Ethernet ports, the 3-5002 supports both NSA non-independent and SA independent working modes, allowing control signaling to anchor to either 4G or 5G protocols as needed. Innogence supports route forwarding, firewalling, and other traffic optimization features as well as excellent ruggedness, which clearly helps with dependability in difficult environments such as mining operations.

Core. In 5G infrastructure, the core system controls network device signaling and most communication services. In contrast to in legacy communications infrastructure, modern 5G cores abstract functionality and run services as software. This allows for considerable device consolidation and savings in both cost and energy consumption. Innogence's 5GC core supports both NSA and SA architectures and the ability to split network functions across hardware resources as needed. This model also support network function virtualization (NFV) to mirror the resource flexibility enabled by cloud computing models. Services can expand, shrink, or change/upgrade as needed, alleviating the need to overprovision.

The Innogence 5GC requires a hardware foundation with enough power and configurability to enable its full potential. For this, Innogence selected ADLINK's MECS-6110 edge server. With only a 1U rack height, the MECS-6110 integrates an Intel® Xeon® D processor, up to 256GB of RDIMM memory, both SATA and M.2 storage, and multiple PCI Express interfaces. The system's performance is channled through a range of network ports, including two Gigabit Ethernet and four 10G SFP+ interfaces. All of this processing power and connectivity supplies the resources needed for a small- to medium-scale, NFV-based 5G RAN deployment, and it leaves ample scaling opportunity to accommodate future application growth.

Results

5G Networks Improved the Overall Quality Control and Productivity Noticeably

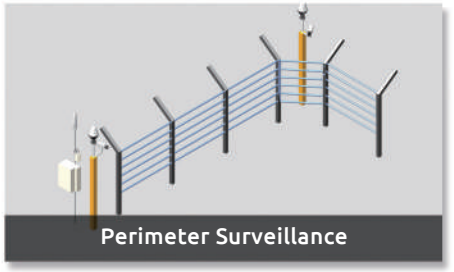
By recently implementing 5G infrastructure from Innogence and ADLINK across its operations, the limestone miner is already well on its way to realizing its production goals. Even in the short term, though, the company is already seeing multiple benefits.

With 5G available throughout the mining facility, surveillance cameras have become an easy, affordable means to centralizing site supervision and extending that supervision to more places than ever possible before. 5G connectivity backed by sufficient carrier infrastructure ensures more than enough bandwidth for high resolution at fluid frame rates, which means more effective monitoring and more accurate review of footage.

With so many more monitored cameras in place, fewer staff are needed for live supervision throughout the facility. The mine's control center can monitor all entry points and boundary fences to prevent trespassing, including with AI-driven automation. Workers can be watched for safety practices to help prevent injuries. In cases of disputes, stored footage can quickly help resolve conflicts.

5G also enables the company's new weighbridge to operate without any staff present. Camera systems can detect and read vehicle license plates for load identification. Rather than exit their vehicles, drivers simply input data on-screen questions. There's no ambiguity, no accidents in data recording, and no need to halt work due to limited hours. Quality control and productivity both noticeably improve. Overall, the limestone miner saw its weighbridge efficiency increase by 200 percent.

Through the deployment of 5G network slicing, MEC and UPF in the application field, the requirements of smart 5G mine private network are realized: no data leakage, intelligent and unmanned mining area, high-efficiency management, and cost reduction.


Perimeter Surveillance


Unmanned weighbridge


Truck video monitoring


Video monitoring

Why ADLINK

ADLINK Unlocks the 5G Value with Open Standards-based COTS Edge Servers

ADLINK assists with total solution engineering, customization, testing, and validation. ADLINK also assists with post-sale support and can provide service to customers around the world through its network of regional offices and affiliates.

By leveraging more than two decades of expertise in developing highly reliable and available embedded computing systems, ADLINK became a premier supplier to worldwide leading telecommunications equipment manufacturers (TEMs) and networking solution providers. ADLINK's carrier-grade, open standards-based COTS and custom solutions enable solution providers to speed time-to-market by focusing on differentiating their next-generation applications at the edge of both cloud and mobile networks. ADLINK is committed to helping providers like Innogence facilitate the transformation to 5G network infrastructure and open enormous opportunities through the creation of new services.

Making ADLINK the foundation of a 5G infrastructure deployment provides stable solution performance, world-class technical support, and close project collaboration. ADLINK has the resources and vertical integration necessary to deliver extended support longevity when needed and adaptability when customers require changes and innovation. This is only part of why ADLINK continues to make its name synonymous with quality and integrity throughout the computing industry.

Validated for NGC-Ready and AWS IoT Greengrass, ADLINK's OTII-compliant Edge Server MECS series provides a versatile, cost effective and scalable white-box solution to facilitate deployment of 5G RAN and private networks, and enable a wide range of 5G use cases, including 5G DU/CU in open RAN and private networks in smart factory, mining, transportation and more.

ADLINK Edge Servers & FEC Accelerator Adapter

MECS-7211



MECS-6120



MECS-6110



PCIe-ACC100



Designs for BBU, 5G. Radio

Rugged Design

High Performance

Expandable for Hardware Accelerators

About Innogence

InnoGence provides "Terminal"-5G intelligent industrial gateway, "Pipe"-5G Picocell products, "Edge"-MEC, "Cloud"-5G core network and 5G physical layer full stack technology products that can be deployed in 5G smart factory, mining and industrial park settings. By mastering 5G core technology, providing competitive and differentiated RAN application products, technical products and solutions, focusing on the 5G technology and industrial applications, InnGense is committed to becoming the most reliable partner for customers' performing industrial upgrades.



Private 5G Network Accelerates Industrial IoT Applications

ADLINK collaborated with its partner, Innogence Technology, to integrate a Private 5G network system into an open pit mine complex at Mount Emei. Thanks to the respective strengths of both providers, the project was completed on schedule and within the operator's budget.

The limestone mine leveraged the benefits of its 5G installation with IoT devices and data-centric applications, such as analytics and visual recognition systems, to make full use of the newly available wireless connectivity. The company improved its video surveillance and implemented a perimeter alarm. By upgrading to an unattended weighbridge, the firm improved operational throughput and efficiency. Not least of all, AI-based applications and conversion to more "smart" mining processes improved worker safety, improved profitability, and put the customer's ambitious business goals firmly within reach.

Learn more about >>
ADLINK 5G & MEC Solution

https://www.adlinktech.com/en/5g-and-mec