

Leading Mining Company Hits Paydirt with 5G Network

By deploying a Comba FLeX5 5G network, using Intel® Xeon® D CPUs, a Chinese mining company reduced underground manpower by 50% to 75% and enhanced safety by offloading dangerous manual functions to machines

At a Glance

- Chinese mining conglomerate
- Operating 10 mines
- Countrywide service area, including Shandong and Inner Mongolia



The global mining market is expected to grow¹ from \$1.8 trillion in 2021 to \$2.4 trillion in 2025, a compound annual growth rate (CAGR) of 7.1%. To underscore how large and vital the industry is, mining revenues are as big as a number of the [world's top ten national economies](#)², coming in after Canada's gross national product of \$2.0 trillion and ahead of Korea's \$1.8 trillion GNP.

In addition, the market is manually demanding and prone to possible injuries and death. The Chinese mining industry has seen its fatalities come down in recent years, [but they are still high at 434 deaths](#)³ in 2020.

Recent technology advances have made it possible for miners to streamline business processes, increase productivity, respond to customer needs faster, reduce costs, and grow revenue and profits. However, mining conglomerates typically have been slow to adopt leading technologies because of their upfront cost and the industry's unique business processes.

Comba, using technology from Intel, helped a leading Chinese mining company buck this long-standing tradition by implementing a modern digital transformation solution, one based on 5G networking and edge technology with smart sensors and high-definition cameras. The new network dramatically improved its operations.

Solution Details

The Chinese mining company wanted to jump onto the digital transformation bandwagon and take advantage of new capabilities like intelligent automation. However, their legacy network could not support the new requirements, so an upgrade to a private 5G network was needed.

Because of the industry niche, they needed a customized network build and looked for a third party to help with selection, deployment, and ongoing maintenance. As a result, they examined packages from leading turnkey solution providers and selected Comba Group and its FLeX5 system, which delivers high bandwidth, low latency, and highly available network services.

Comba is an Intel® Network Builders ecosystem partner. The company was established in 1997 and specializes in wireless and information communications systems. With more than 30 offices in China and over 10 other offices worldwide, Comba provides products and services in more than 100 countries and regions.

Comba has successfully helped its mining operator customer to build dedicated private 5G networks in 10 mines located in several Chinese provinces, including Shandong and Inner Mongolia. The networks not only provide voice and data services for workers, but also enable new 5G Industrial Internet of Things (IIoT) services, like smart drilling, constant HD video surveillance, and virtual reality.

FLeX5 is a Complete Private 5G Solution

FLeX5 Flexible
 Light
 enable
 X for all industries
 5 (5G cloud-based small cell, Light MEC, Light 5GC, IoT, NMS)

The Comba FLeX5 is a private 5G solution for enterprise networks. The system delivers on the promises of 5G - very high bandwidth, low latency, high availability and reliability. It is designed for industrial applications as well with hardened enclosures and reliability features. The FLeX5 product family is built on a disaggregated radio access network (RAN) architecture that allows the software to be run on Intel architecture commercial off-the-shelf (COTS) servers for flexible and scalable deployment.

The complete product family includes the following products:

- 5G New Radio (NR) Baseband Unit (AU) providing layer 1/2/3 signal processing
- 5G NR Extension Unit (SW) that supplies data merge features for any uplink, and forwarding for any downlinks
- 5G Remote Radio Unit (RRU) is an outdoor wireless radio transceiver
- Multi-access Edge Computing (MEC) systems to process network traffic as well as other digital transformation applications

- 5G Core Network (5GC) that connects end users and devices to the mining network
- Network Management System (NMS) that supports fault configuration management; performance and user management; and monitoring of system logs

Built Using Intel Technology

The FLeX5 servers are built using Intel® Xeon® D processors, a system-on-chip (SoC) solution created to support edge computing. It features a one-package design with built-in AI, security, advanced I/O and Ethernet, plus dense compute capabilities. The chip delivers the high data throughput needed for emerging edge application requirements.

For layer 1 performance, the Comba FLeX5 integrates Intel's FlexRAN™ reference architecture. The software enables Comba to build and deploy highly optimized, feature-rich, 4G and 5G scalable cloud-native vRAN solutions covering both above-ground and below-ground mining operations. FlexRAN software provides complete PHY functionality with superior performance.

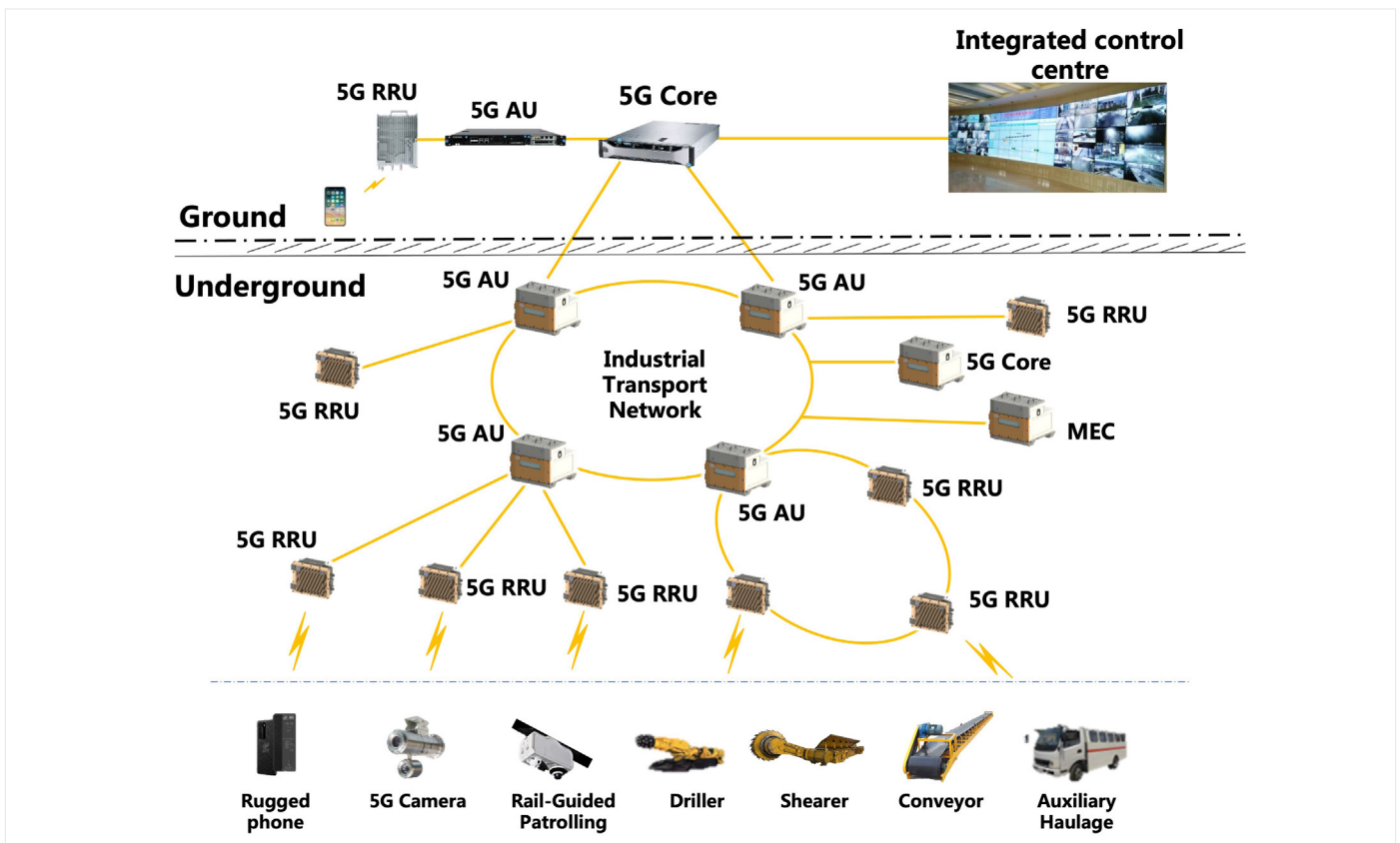


Figure 1. The complete solution that Comba delivered to its mining customer.

Figure 1 shows the wide range of equipment and applications that Comba's mining customer has been running on its 5G network, which has become the foundation of its daily operations.

The Comba product suite includes the following technologies in its ecosystem:

- Servers that run business functions as well as specialized mining functions, like drilling, extraction, and transport
- Intelligent sensors, drills, shearers, and conveyors provide real-time information tracking of mining progress.
- Industrial phones deliver voice communications, so employees in the mines can communicate with coworkers above ground.
- Custom mining helmets featuring virtual reality capabilities to ensure that work is done properly
- Remote radio units that are strategically placed to provide coverage through the mines and field operations buildings
- A closed-circuit 5G camera system that is used for real-time images of mining operations
- A cloud-based management system monitors and troubleshoots the network if any problems arise.

The mine customer's comprehensive solution includes the following features:

- **Scalability:** The company can deploy special purpose network connections in sections of its mines in addition to its comprehensive enterprise network that extends from the bottom of the mine to its above-ground onsite offices.
- **Improved Performance:** With the network equipment onsite, information is processed locally rather than transmitted to the data center, dramatically reducing enterprise network usage, and improving network and system performance.

- **Openness:** The FLeX5 network allows interworking among different platforms and applications, so Comba's mining customer could integrate the network with its information technology and operational technology infrastructure, which historically had been siloed. As a result, the mining company has a more complete picture of how well its operations are performing.
- **Software-Based Solution:** The system decouples network function hardware and software, so the customer's applications run on COTS hardware, greatly reducing its cost.
- **Security:** The standalone private network and all of its equipment operate locally and are physically secured on the company's premises.
- **Reliable:** The system uses a ring topology for signal rerouting without disruption. A backup 5G core can also be deployed in the event of a failure of the primary core.

Business Results

The mining company's new network supports three applications that significantly improved business performance.

Application 1: 5G and Intelligent Coal Extraction

This application features a 5G base station and antenna, 5G customer premise equipment (CPE), and HD cameras, to better monitor and control a specialized cutting machine called a coal shearer. The cameras collect data as shearers move back and forth, pulling coal from the mines. The system learns the pattern of the movements and navigates them automatically. Data analytics auto-align the shearer to avoid collisions and going off track. Realizing remote operation allows the operator to monitor the extraction process from the control room, reducing manpower in the mine.

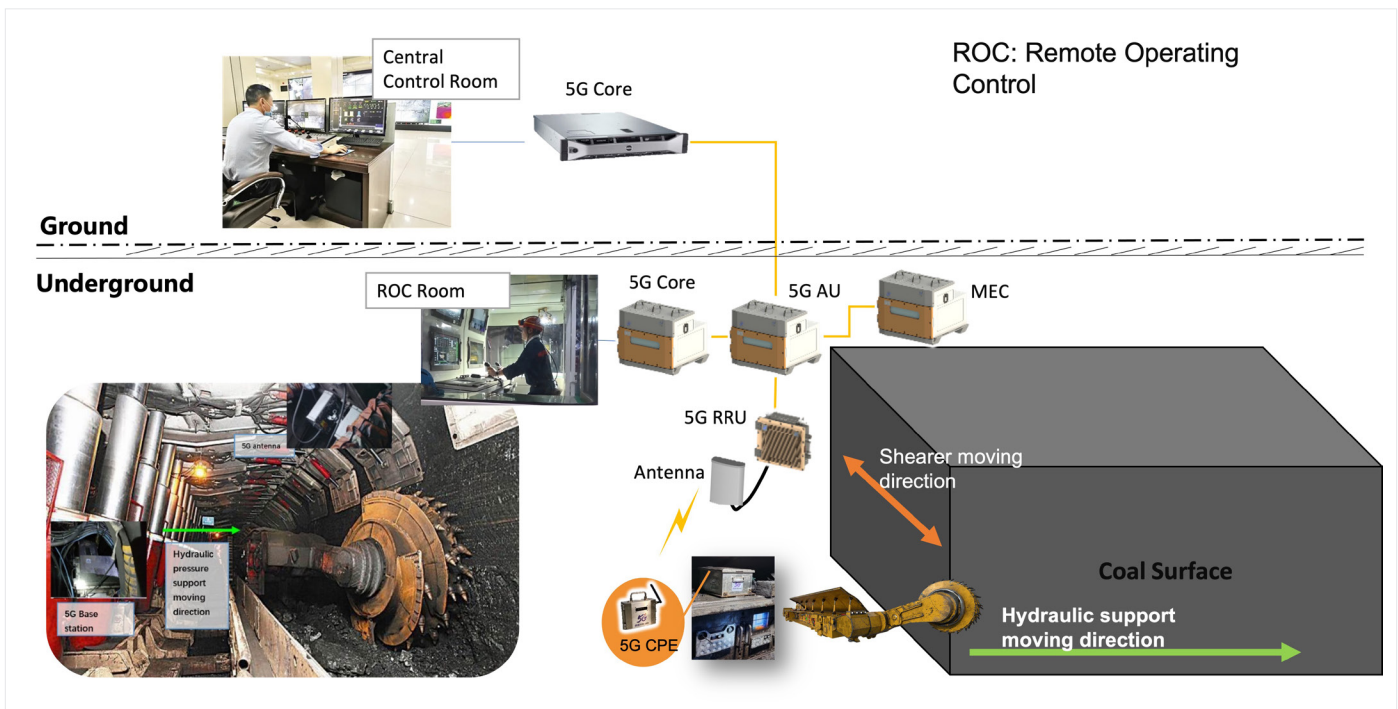


Figure 2. A picture of application 1 that shows remote control of the coal shearer.

Application 2: 5G and AR Remote Diagnosis and Coaching

Underground workers at the mine use smart helmets with augmented reality glasses to communicate with coworkers located above the ground. Camera application software is deployed on COTS hardware for real-time data sharing. If problems arise, remote technical assistance is readily available. Miners receive real-time instruction and analysis from experts who can help them diagnose and troubleshoot any problems.

Application 3: 5G Underground Intelligent Patrolling

One factor that makes mining a dangerous business is the ever-shifting earth which creates potential safety issues. The mining customer has set up a rail system that allows HD cameras to constantly watch the facilities and provide real-time inspection of the environment, equipment, and people. The solution also has environmental sensors and generates automatic notifications when detecting abnormal levels of items like poisonous gas, smoke, and water seepage, or sensing the possibility of a collapse. This application improved security and underground safety.

Conclusion

Mining, a mature but revenue-generating industry, has traditionally been stodgy and slow to adopt new technology. Comba, using Intel Xeon D processors and FlexRAN software, helped its giant Chinese mining customer to go against the grain and deploy FLeX5, a leading-edge 5G network, one that tied together with its operations, business, safety, and mining. As a result, the mining company is now an industrial pioneer in leveraging 5G edge capabilities to rewrite business processes, eliminate inefficiencies, reduce costs, improve safety, and enhance market competitiveness.

Learn More

[Comba FLeX 5](#)

[Intel® Xeon® D](#)

[FlexRAN™](#)

[Intel® Network Builders](#)



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¹ <https://www.prnewswire.com/news-releases/global-mining-market-report-2021-301241616.html>

² [https://en.wikipedia.org/wiki/List_of_countries_by_past_and_projected_GDP_\(nominal\)](https://en.wikipedia.org/wiki/List_of_countries_by_past_and_projected_GDP_(nominal))

³ http://www.xinhuanet.com/english/2021-01/12/c_139660835.htm

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