



SMART MINING WITH COMBA FLeX5

Case Study

June 2021
Comba Group



COMBA GROUP INTRODUCTION

Established in 1997 and listed in the Hong Kong Stock Exchange in 2003, Comba Group is a global leading solutions and services provider of wireless and information communications systems with its own R&D facilities holding 4,800 patents, a manufacturing base of 80,000 square meters, as well as global sales and service teams.

Comba's core product portfolio includes antennas and subsystems and network products (DAS, Small Cells, Repeater, RRU, etc.), offering turnkey solutions for indoor and outdoor 2G/3G/4G/Wifi/5G to our global customers with services covering consultation, network design, optimization, and commissioning. The company has footprint in wireless network projects in shopping malls, airports, sports stadiums, government buildings, and telecom operator headquarters across multiple global regions.

With more than 30 offices in China and over 10 overseas offices worldwide, Comba provides products and services in more than 100 countries and regions. The company has strong foothold in APAC regions particularly in Singapore and Thailand. For example, Comba demonstrated its expertise in providing best-in-class wireless solution to a metro line in Bangkok with a wide range of services including consultancy, DAS system design, drive test and benchmarking, maintenance, managed services, network data analytics, network optimization and training. Moving towards the era of Internet of Things, Comba's know-how in delivering quality wireless networks with high capacity, fast speed and stable connectivity are indispensable to support the evolution of smart cities.



BACKGROUND

As industries jump on the bandwagon of digital transformation and intelligent automation, there are new network requirements that legacy system could not meet. The new network should allow mining customers to perform intelligent data analytics, reduce workforce, and autonomous operation.

Comba has successfully helped mining companies build dedicated private 5G network in eight mines located in several provinces, including Shandong and Inner Mongolia, China. It is not only providing voice and data services for workers, but also enabling 5G+ industrial IoT services.

This case study will discuss how **Comba FLeX5** enables industrial grade services in coal mining.

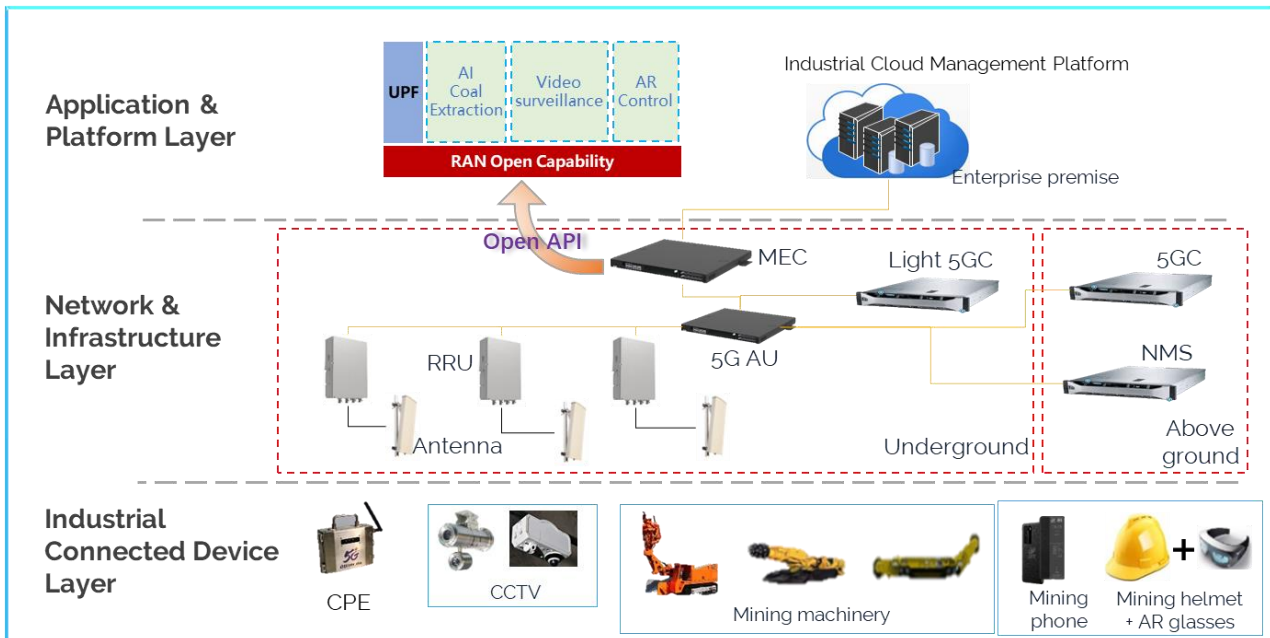
FleX5 – COMBA 5G PRIVATE NETWORK SOLUTION

FLeX5








Flexible
Light
enable
X for all industries

5 (5G cloud-based small cell, Light MEC, Light 5GC, IoT, NMS)

FLeX5 supports large bandwidth, low latency, highly available and reliable networks satisfying various fragmented, diversified, and complex industry applications. It is comprised of a collection of network elements forming an end-to-end solution, including light-5GC, light-MEC, NMS, 5G Small Cell, and IoT devices. Disaggregated RAN architecture allows software to be hosted on **COTS hardware**, enabling flexible and scalable deployment for enterprise’s needs.



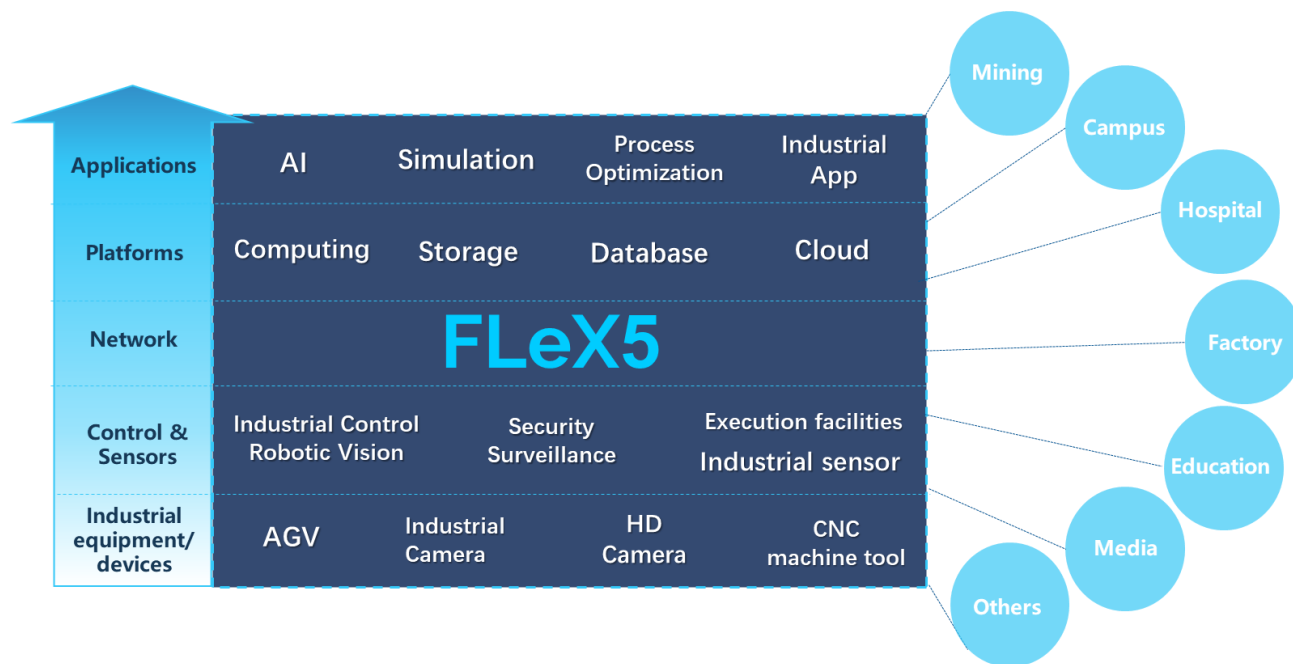
PRODUCT HIGHLIGHT

<p>AU</p> 	<p>5G NR Baseband Unit based on COTS Hardware</p> <ul style="list-style-type: none"> • Layer 1/2/3 signal processing • Support local breakout
<p>5G SW</p> 	<p>5G NR Extension Unit (Indoor Small Cell)</p> <ul style="list-style-type: none"> • Data merge for uplink, and forwarding in downlink • Power supply for Distributed Unit (DP) via hybrid (optical + power) cable
<p>5G DP</p> 	<p>5G NR Distributed Unit (Indoor Small Cell)</p> <ul style="list-style-type: none"> • Radio transmitter with integrated antenna • Provide 5G wireless coverage to indoor
<p>5G RRU</p> 	<p>5G Remote Radio Unit (Outdoor Small Cell)</p> <ul style="list-style-type: none"> • Outdoor radio transmitter with RF output • External antenna port for antenna
<p>NMS</p> 	<p>Network Management System</p> <ul style="list-style-type: none"> • Fault configuration management • System log and tasks management <p>Performance and user management</p>
<p>Light-Weight MEC</p> 	<p>Multi-access Edge Computing Based on COTS Hardware</p> <ul style="list-style-type: none"> • On-premise deployment • Open API for 3rd party integration • Allows application data to be processed locally • Support local breakout
<p>Light-Weight 5GC*</p> 	<p>5G Core Network Based on COTS Hardware</p> <ul style="list-style-type: none"> • Support N1/N2/N3/N6 interface • UE management (registration, authorization, mobile management, data cache) • Up and down streaming data routing

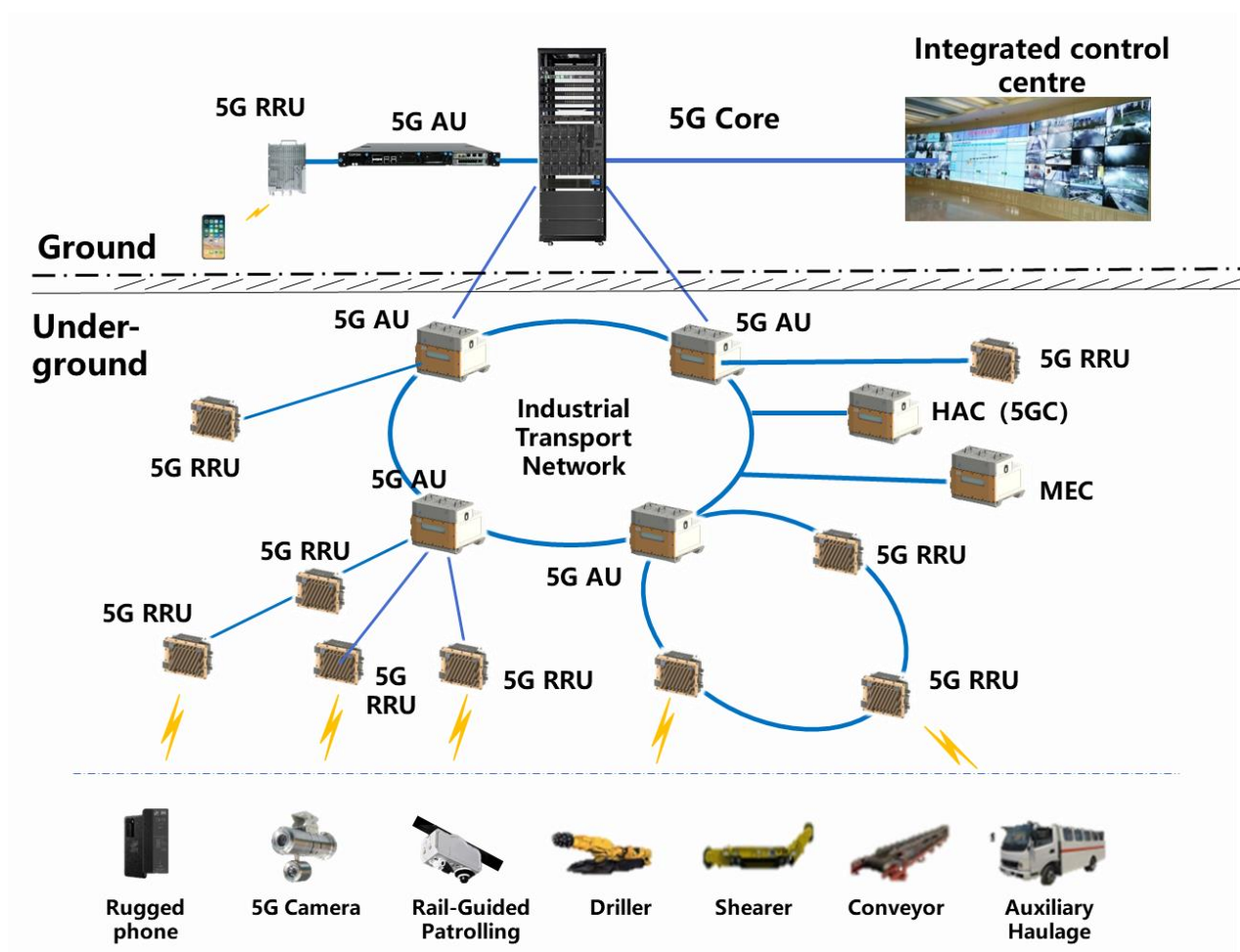
*Interoperability with other core vendor can be supported.

Ecosystem partnership based on FLeX5

There are four layers in the ecosystem structure: Control & Sensors, Network, Platforms, and Applications. It requires cooperation of players from upstream to downstream to build this industry ecosystem. FLeX5's openness allows interworking between different platforms and applications, and facilitates integration between IT and CT infrastructure. In this extensive collaboration, Comba and partners have worked together to build a comprehensive 5G solution for a multitude of vertical industries.



ACTUAL DEPLOYMENT APPLIED IN MINING



SOLUTION HIGHLIGHT

<p>Security/ Safety</p>	<p>Data security</p> <ul style="list-style-type: none"> Enterprise data remains within the premise, high level of data protection. <p>Architecture:</p> <ul style="list-style-type: none"> Standalone private network, all equipment installed locally. <p>Equipment</p> <ul style="list-style-type: none"> As part of the national requirement, Comba work with local partner, make sure the equipment installed are explosion-proof and intrinsic safety certified.
<p>Flexible</p>	<p>Customized network</p> <ul style="list-style-type: none"> According to venue and business requirement. <p>Software/ hardware disaggregation:</p> <ul style="list-style-type: none"> Customised software runs on COTS hardware. Allows resource pooling, scalable capacity and easy expansion. <p>Unlimited data:</p> <ul style="list-style-type: none"> Dedicated SIM card with unlimited data usage, no more monthly subscription. <p>5G integrated EMS:</p> <ul style="list-style-type: none"> Centralized management system, full control and access to all network elements.
<p>Reliable</p>	<p>Redundancy</p> <ul style="list-style-type: none"> Using ring topology, signal can re-route without disruption. Secondary 5GC also available in the event of primary 5GC experience outage.

ENABLING USE CASES

Use case 1: 5G+ Intelligence Coal Extraction

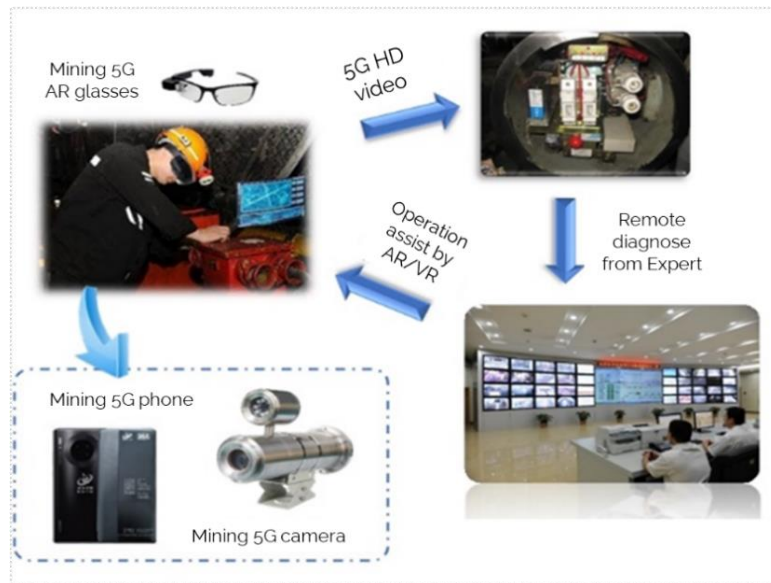
Base station and antenna installed as shown in the picture. HD camera and coal shearer **connect to 5G network via CPE**.



- Collect data when shearers moving back-and-forth along the longwall
- System learns the pattern of the movement, and navigates automatically
- Using intelligent video analysis, shearer can auto-align to avoid collision and offtrack
- Remote control to the shearer

Use Case 2: 5G+ AR Remote Diagnose/Coaching

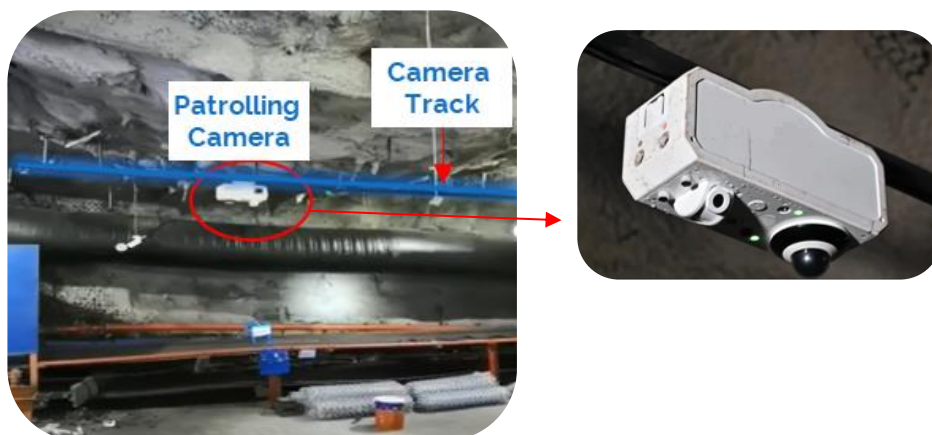
Staff wear smart miner helmets. Remote technical assistance is available throughout the mine by skilled overground based technical experts.



- Underground workers equipped with smart miner helmet and AR glasses, communicating with experts located above the ground
- Camera application software is deployed on COTS hardware for real-time data sharing
- Real-time instruction and analysis from expert
- Highly effective diagnosis and troubleshooting

Use Case 3: 5G+ Underground Intelligent Patrolling

Real-time inspection (people, equipment, environment)



- 360-degree camera patrol along the track, collecting real-time videos
- Camera application is deployed in the COTS hardware
- Automatic warning notification when detecting abnormal level of poisonous gas, smoke, water seepage or collapse
- Improve security and safety underground

ABOUT COMBA GROUP

Comba Group is a leading supplier of infrastructure and wireless enhancement solutions to mobile operators and enterprises to enhance and extend their wireless communications networks. With over 50,000 system deployments around the world including turnkey in-building systems, urban/rural wireless systems, and transport wireless networks, Comba Group's end-to-end network solutions include consultation, network design, optimization and commissioning. Comba Group's product portfolio includes DAS, small cells, tower mounted systems, antennas, subsystems, passive accessories, Wi-Fi systems and digital microwave links.

Listed on the Hong Kong Stock Exchange, Comba Group is headquartered in Hong Kong and has operations throughout the Americas, Europe, Middle East, Africa and Asia Pacific. To learn more, visit www.comba-telecom.com and follow Comba Group on [LinkedIn](#) for regular updates.



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