

Enterprise network managers considering private 5G
Mining, smart city, other enterprises

BON Corp.'s TranCELL Picocell Targets Private 5G Networks

BON Corporation's (BONC) TranCELL picocell is a turnkey 5G radio access network and network core solution delivering high throughput and enhanced 5G coverage across private networks



Private 5G networks use the same cellular technology as the public network but are sized to provide high-performance wireless connectivity to government agencies, manufacturing and enterprises. With new systems and spectrum availability, the private 5G market is taking off.

Researchers predict that the global market will approach \$15 billion in value by 2028.¹ Customizable private 5G networks are scalable and can be adapted for a wide range of use cases and industries.

While private 5G networks can be used in a wide variety of sectors, mining and smart cities are both greenfield markets that offer particularly interesting applications. These seemingly disparate industries both benefit from increased and automated connectivity and low-latency access to data.



For mining companies, private 5G offers new possibilities for automation in operations, including increased connections between vital sensors. 5G helps team members be better informed on conditions in the mine and may provide clearer records of how conditions evolve over time. 5G may also make cloud-based, centralized management more effective.

As a result, the work of the mine may benefit by increased safety, as well as an increase in efficiency.

For smart cities, private 5G enables improvements in connectivity in a variety of ways, from urban infrastructure to public security cameras to providing service for mobile phones. Real-time data on city life can be collected and shared without being intrusive. Cloud-based system management platforms can also be integrated into smart city set-ups. Digitizing feedback via private 5G allows cities to improve and ease urban administration.

Bon Corp. has developed its TranCELL private 5G small cell system for both of these applications. Bon Corp, an Intel® Network Builders ecosystem partner, is headquartered in Beijing, China, and focuses on big data, 5G, cloud computing and AI technology in the markets of intelligent manufacturing, mining, smart cities and private network. The company has more than 25 years of combined experience and expertise and has approximately 7,000 R&D and service employees.

TranCELL Offers Complete Private 5G Picocell Solution

From remote radio units (RRU) to the radio access network (RAN) to the 5G core, TranCELL offers a robust portfolio of 5G products for accelerating network deployments. TranCELL systems can be deployed as a picocell, offering a coverage range from 50 to 60 meters. In laboratory tests in enclosed, indoor environments and without a steel door or other metal obstructions blocking the signal, the TranCELL demonstrated coverage of 110 meters, or 20 meters² through a wall.

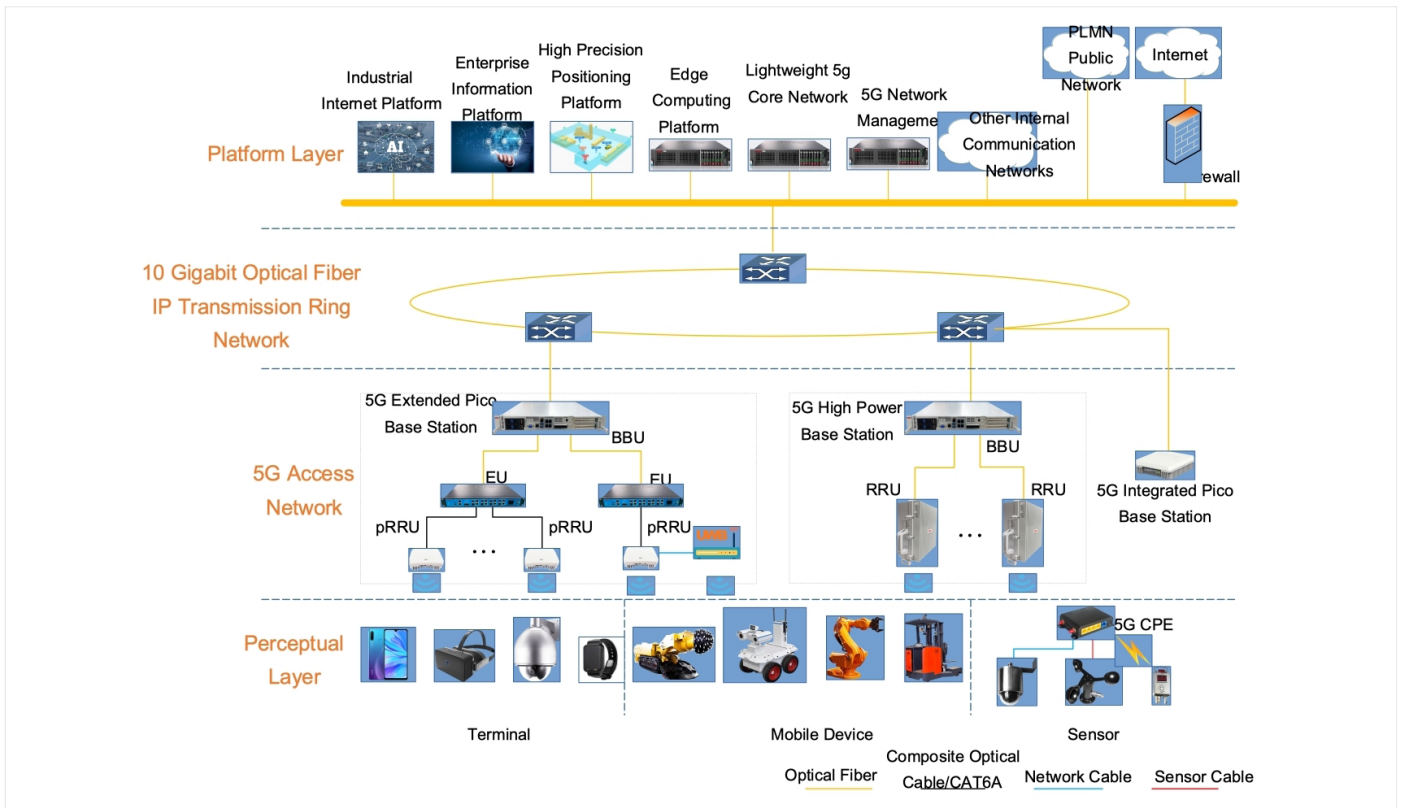


Figure 1. Example use case for TranCELL private 5G network.

The use case in Fig. 1, shows an example of the flexibility of the system. The TranCELL radio frequency (RF) and baseband unit (BBU) system components are shown in the 5G access network layer and provide 5G RF connections to a wide range of terminals and mobile devices. Moving up the stack to the backhaul layer, the picocells can utilize IP or fiber-optic backhaul networks to connect to the platform layer for access to the 5GC server as well as to security or other systems and to the internet.

The TranCELL picocell consists of the following components:

Baseband Unit (BBU)



The RF foundation of the TranCELL picocell is Open RAN-compliant BBU software running on a 3rd generation Intel® Xeon® Scalable processor powered Open Telecom IT Infrastructure (OTII) server platform. The openness of the server design allows other application software stacks to run on open cores, enabling greater innovation in the system.

The virtualized BBU runs in standalone mode and contains both the distributed unit (DU) and centralized unit (CU) functionality. This BBU also supports four 100MHz remote radio heads with four transmit and four receive antennas (4T4R) each supporting 400 active users. The server supports GPS, BeiDou Navigation Satellite System, and IEEE 1588v2 clock synchronization.

3rd generation Intel Xeon Scalable processors are a next-generation CPU platform ideal for virtualized RAN applications. They were built for cloud-optimized edge networks; deliver edge application, services, and control plane processing; high-performance packet processing; and signal processing. The virtualized, software-defined infrastructure supports legacy and cloud workloads.

TranCELL's BBU also benefits from the Intel(R) OpenVINO™ toolkit which converts and optimizes AI models trained using popular frameworks like TensorFlow, Pytorch, and Caffe* for deployment on Intel® architecture hardware and environments. The system can accommodate several common frameworks and streamlines both training and deployment across host processors and accelerators and environments. For high Layer 1 performance, the BBU uses Intel FlexRAN™ 4G and 5G baseband PHY reference design for Intel Xeon Scalable processors.

TranCELL accelerator card



For increased performance, the BBU contains a TranCELL accelerator card delivering low PHY and forward error correction (FEC) packet processing workload. The card is built to accommodate the BBU's 4T4R cell processing capacity and synchronization. The acceleration card features four 25GbE fronthaul ports and one 10GbE 4G cascaded port, including support for Common Public Radio Interface (CPRI) and eCPRI.

The TranCELL accelerator card is based on Intel® eASIC™ technology, and the Intel® vRAN Dedicated Accelerator ACC100, which is designed to offload and accelerate vRAN computing-intensive forward error correction (FEC) workloads freeing up CPU processing power.

Intel eASIC devices are structured ASICs, an intermediate technology between FPGAs and standard application-specific integrated circuits (ASICs).

Extended Unit



The TranCELL Extended Unit (EU) is an optional module that can support downstream signal broadcasting and upstream signal aggregation with its flexible and dynamic cell data merging and splitting. The EU can support two remote power supply modes – photoelectric hybrid cable and power over Ethernet (PoE) – simultaneously. It also supports CPRI/eCPRI fronthaul interface and eight 10GbE downlink ports and two 25GbE uplink ports.

Picocell Remote Radio Unit (pRRU)



The TranCELL pRRU can support 2.6GHz and 3.5GHz bands with its four optional built-in or external antennas, with 250mW transmission power-per-channel. The pRRU also supports standard CPRI interfaces and photoelectric composite cable and PoE power supplies.

TranCELL's pRRU has been built for performance using Intel® Stratix® 10 FPGAs and or Intel® Arria® 10 FPGAs. Intel Stratix 10 FPGAs offer up to twice the core performance and seven times the transceiver bandwidth versus earlier FPGAs. Intel® Arria®10 FPGAs are the industry's only 20 nm ARM-based FPGA SoC and can operate at as much as 40% lower power than earlier FPGAs and SoCs.

Lightweight 5G Core Network



The TranCELL 5G core network software, running on an Intel Xeon Scalable-based server can support bare metal or virtualized deployments for up to 100,000 attached users connected to up to 50 base stations. The maximum throughput of the system is more than 50Gbps.

The 5G core offers the full range of 3GPP standards-based functionality including access and mobility, session management, user plane, authentication server, network slice selection, network repository, network exposure, policy control and application functions, as well as unified data management.

The TranCELL system is optimized for deployment in a wide range of applications, including mining operations, both surface and underground. TranCELL is capable of offering increased and efficient connectivity for devices and workers in these environments.

Conclusion

Private 5G networks are an emerging option for enterprises and governments that need flexible network services to deliver both high-bandwidth (such as data streaming) and high-connectivity (such as IoT). Bon Corp. is moving to take advantage of this opportunity with its TranCELL complete private 5G picocell solution. Powered by Intel architecture CPUs, FPGAs and accelerators, the TranCELL product is targeted at smart city and mining applications, but the complete 3GPP standards-based approach means TranCELL can be used in any 5G application across any type of enterprise.

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¹<https://www.marketresearch.com/Grand-View-Research-v4060/Private-5G-Network-Size-Share-14553525/>

²Source: Bon Corp. internal testing.

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