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Comba* Develops Private 5G Network for Smart Manufacturing

Comba's FLeX5 is a complete 5G private network that is optimized for manufacturing and industrial applications. The system uses Intel® Xeon® D CPUs and an ecosystem of technologies for performance and customization.

Smart manufacturing focuses on the digitization of manufacturing processes, like raw material preparation, parts assembly, production, packaging, and delivery. Enterprises used to rely on wired networks for the transformation, but recently, the availability of private 5G networks to allow cost-effective wireless connectivity has accelerated this digitization trend.

Private 5G, IoT, AI, and other automation technologies can be deployed efficiently. Robotics can be programmed to learn in real-time thanks to the low-latency connections making them even more valuable in high-performance production lines. 5G-based smart manufacturing also allows for reconfiguration of the manufacturing floor without issues related to relocating network cabling.

Overall, industry analysts state that these innovations have led the smart manufacturing market to be valued at nearly $260 billion in 2021[1], with 13.4% annual growth predicted from 2022 to 2030.

Recent technological advances have made it possible for smart technology providers to streamline business processes, increase productivity, respond to customer needs faster, reduce costs, and grow revenue and profits. To meet the needs of this market, Comba, using technology from Intel®, has developed its FLeX5 private 5G network system that can be configured to overcome smart industrial challenges, using both 5G networking and edge computing technology with smart sensors and high-definition cameras.

Comba is an Intel® Network Builders ecosystem alliance member. The company was established in 1997 and specialized 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 FLeX5 Delivers Smart Industrial 5G

In collaboration with China Mobile, Comba deployed a private 5G+ network and applications in its manufacturing factory in Guangzhou as nominated by the Ministry of Industry and Information Technology of Guangdong Province to take part in "5G+Industrial Internet" Application Demonstration Park Pilot Program.

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 a range of enterprise networks, including not only smart factories but also mining, smart cities, sports stadiums, and others. The system delivers on the promises of 5G - very high bandwidth, low latency, high availability, and reliability. It is optimized for outdoor deployments with hardened enclosures and high-reliability features. The FLeX5 product family is built on a disaggregated radio access network (RAN) architecture that allows the software to be run on commercial off-the-shelf (COTS) servers based on Intel processors for flexible and scalable deployment.

The complete product family (see Fig. 1) includes the following products:

- 5G New Radio (NR) Baseband Unit providing layer 1/2/3 signal processing via open standard centralized units (CUs) and distributed units (DUs).

- 5G NR Extension Unit that supplies data merge features for any uplink, and forwarding for any downlink.

- 5G Remote Radio Unit (RRU) is an outdoor wireless radio transmitter with an antenna port for radio signal input and a separate port for RF output.

- Multi-access Edge Computing (MEC) systems to process network traffic as well as other digital transformation applications.

- 5G Core Network (5GC) that performs user and device management including registration, authorization, and mobility management.

- Network Management System (NMS) that supports fault configuration management; performance and user management; and monitoring of system logs.

The smart industrial comprehensive solution includes the following features:

- **Scalability:** The company can deploy special purpose network connections to meet the demand of ever-expanding projects.

- **Improved Performance:** With the network equipment onsite, information is processed locally rather than transmitted to the data center, dramatically reducing enterprise network delay, and improving network and system performance.

- **Openness:** The FLeX5 network allows interworking among different platforms and applications, so Comba's industrial and enterprise customers could integrate the network with its historically siloed information technology and operational technology infrastructure. As a result, private network operators have a more complete picture of how well their operations are performing.
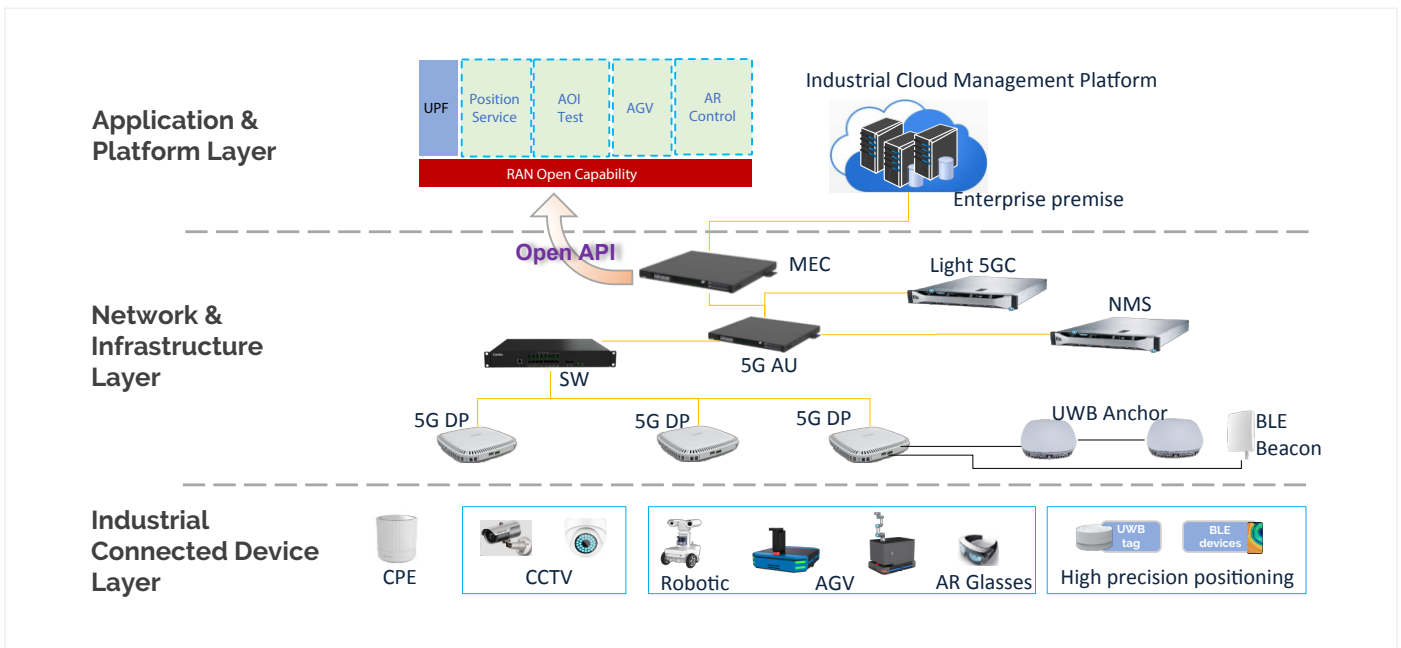

Figure 1. Block diagram of FLeX5 system components.

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- **Software-Based Solution:** The system decouples network function hardware and software, so the customer's applications run on COTS hardware, greatly improving its flexibility.

- **Security:** The standalone private network and all of its equipment operate locally and are physically secured on the customers' premises.

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 with a combination of dense compute capabilities and lower power consumption. These CPUs feature a one-package design with built-in AI acceleration, security, advanced I/O, and integrated Ethernet capabilities that include synchronous Ethernet (syncE) and IEEE 1588 master timing capability often required with direct attached radios.

For layer 1 performance, the Comba FLeX5 integrates the FlexRAN™ reference architecture. The software enables Comba to build and deploy highly optimized, feature-rich, 4G and 5G scalable cloud-native vRAN solutions specifically for smart industrial operations. FlexRAN software provides complete PHY functionality with superior performance.

Ecosystem Adds 5G Functionality

The Comba product family includes technologies from its partner ecosystem (see Figure 2) that expands the functionality of the system. The company has added partner solutions in four areas: control and sensors, network, platforms, and applications. With open standards and the use of industry-standard hardware, Comba's FLeX5 supports interworking between different platforms and applications, and facilitates integration between information technology and communication technology infrastructure. Increased interworking and integration have allowed Comba and its partners to build a comprehensive 5G solution for smart cities as well as a multitude of vertical industries.
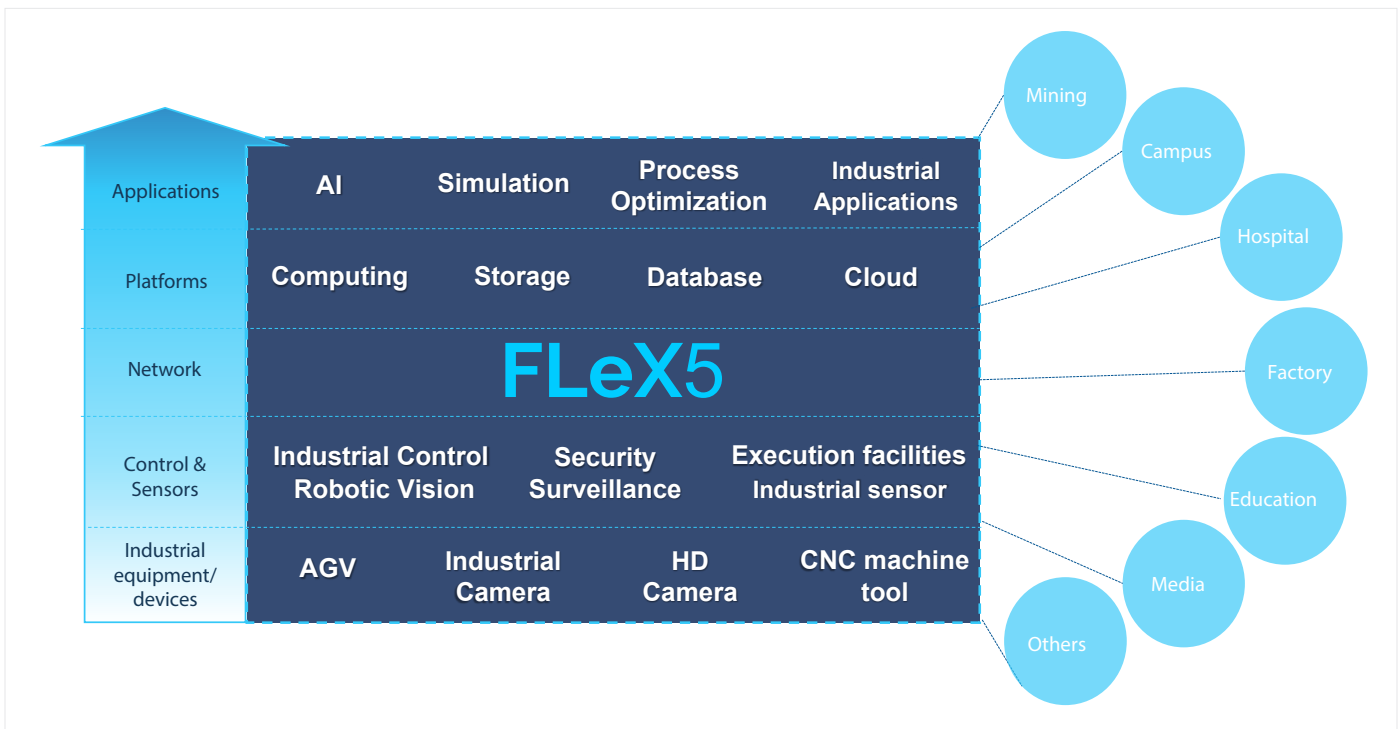

Figure 2. Comba FLeX5 ecosystem strategy.

Smart Industrial Applications

Comba has identified several smart industrial applications that are a good fit for the capabilities of the FLeX5 system combined with additional technology from the ecosystem. These include:

Application 1: FLeX5 Integrated Industrial IoT Platform

This application allows team members to retrieve, store and visualize factory IoT data for integrated management and analysis. This has enabled data sharing and eliminated information silos in legacy systems, and allowed for AI-powered

resource scheduling, dynamic optimization, and automatic decision making. In this application, the FLeX5 platform streamlines processes, increases productivity, and improves efficiency.

Application 2: UWB/BLE Indoor Positioning

Ultra-wideband (UWB) and Bluetooth Low Energy (BLE) are two new wireless protocols that are used for high-precision positioning applications. Sensors using these protocols are interoperable with the private 5G network for asset location tracking and real-time traffic monitoring applications.

Application 3: Automated Optical Inspection (AOI)

This application allows for printed circuit board inspection, allowing users to examine up to 128 pictures of a single PCB to locate defects and judge its quality. This function leverages 5G NR high-capacity bandwidth and high uplink throughput to enable the uploading of large quantities of high-resolution inspection pictures in real-time. Once uploaded, the optical inspection system can detect defects through big data analysis with minimum human intervention to mitigate errors. As a result, quality inspection will be performed at greater efficiency and accuracy.

Application 4: Automated Guided Vehicle (AGV)

The automated guided vehicle (AGV) application is based on simultaneous localization and mapping (SLAM) algorithms that use 5G for AGV navigation via a 5G customer premises equipment (CPE). The SLAM algorithm integrated with the factory's traffic schedule system will distribute parts according to volume and priority, improving production flexibility.

Application 5: 5G-connected Augmented Reality Glasses

These augmented reality (AR) glasses are geared for dual-direction, high-speed live video streaming, with 5G enabled real-time guided operation. This technology has a wide range of use cases, including the training of new workers via remote monitoring and coaching.

Application 6: AI-powered Access Control

The FLeX5 5G network bundled with Comba's ScanVis access control system with a cloud-based central management system (CMS) deployed on a MEC server, allows connection of multiple access control devices (GateGuard) via a wireless 5G network. ScanViS ID GateGuard is an all-in-one system integrating world-leading facial recognition technology with access gates or doors for entry control and attendance tracking, improving users' entry experience.

Conclusion

Smart industrial technology is gaining traction with a growing market share that benefits from emerging technology. Comba, using Intel Xeon D processors and FlexRAN software, has delivered performance and flexibility that enables its FLeX5 private 5G network system to meet the demands of smart industrial applications.

Learn More

Comba FLeX5

Intel® Xeon® D Processors

FlexRAN™

Intel® Network Builders

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