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SageRAN's Protocol Stack Speeds Private 5G to Deploy

SageRAN offers complete private 5G basestation running on Intel® Xeon®-D 1700 processors with open interfaces and flexible multiple vendor integration for private network deployments, reducing lead time and costs.

Industries of all kinds are waking up to the potential of private 5G networks based on small cells for very high throughput combined with low latency. In manufacturing, mining, warehouses and many other settings, these networks can provide the connectivity for next-generation applications that need efficiency, speed and a lower total cost of ownership. Often these networks are the foundation for automation, artificial intelligence and big data analytics in processes. Some specific examples, include:

- **Smart Manufacturing:** This network enabled the use of robots on the assembly floor communicating via 5G modules. One of the robots provided visual inspection of assembled solder joints to ensure the integrity and safety of the final product.

- **Stadium:** A private 5G network provided a solution to expand connectivity to large numbers of fans and team staff during an international sporting event. The added wireless capacity improved the behind the scenes operations as well as let more people share their memories or consume sponsored content. The use of small cells allowed the network to be flexibly deployed where the bandwidth was needed.

- **Airport Operations:** A regional airport installed 5G network coverage for one of its aprons. The private network made it possible for all vehicles, aircraft and other devices on the apron to work under 5G network.

Private 5G requires many small cells to transmit and receive signals, these non-public networks keep information contained and off of public networks, providing protection against insider threats and industrial espionage.[1]

Implementing such networks, however, is not necessarily easy. It demands specialized skills and specialized equipment not typically used in an enterprise network. Systems integrators, mobile network operators (MNOs) or other outside partners often take the lead in designing, implementing and managing the network. Typical private 5G networks are based on multi-vendor hardware and software components, chosen and deployed in the most effective configuration to fit a customer's needs and network size.

To help alleviate some of the complexity, Intel® Network Builder ecosystem partner SageRAN Network Technology has developed a flexible, scalable and high-performance 5G core and open radio access network (Open RAN) protocol stack that provides a complete 5G basestation solution.

Open RAN Enables Private 5G

Open RAN is becoming a popular choice over proprietary legacy RAN systems in industrial settings worldwide. It disaggregates software from hardware, in contrast to the integrated—and vendor-locked—platforms that are common with previous wireless network generations.
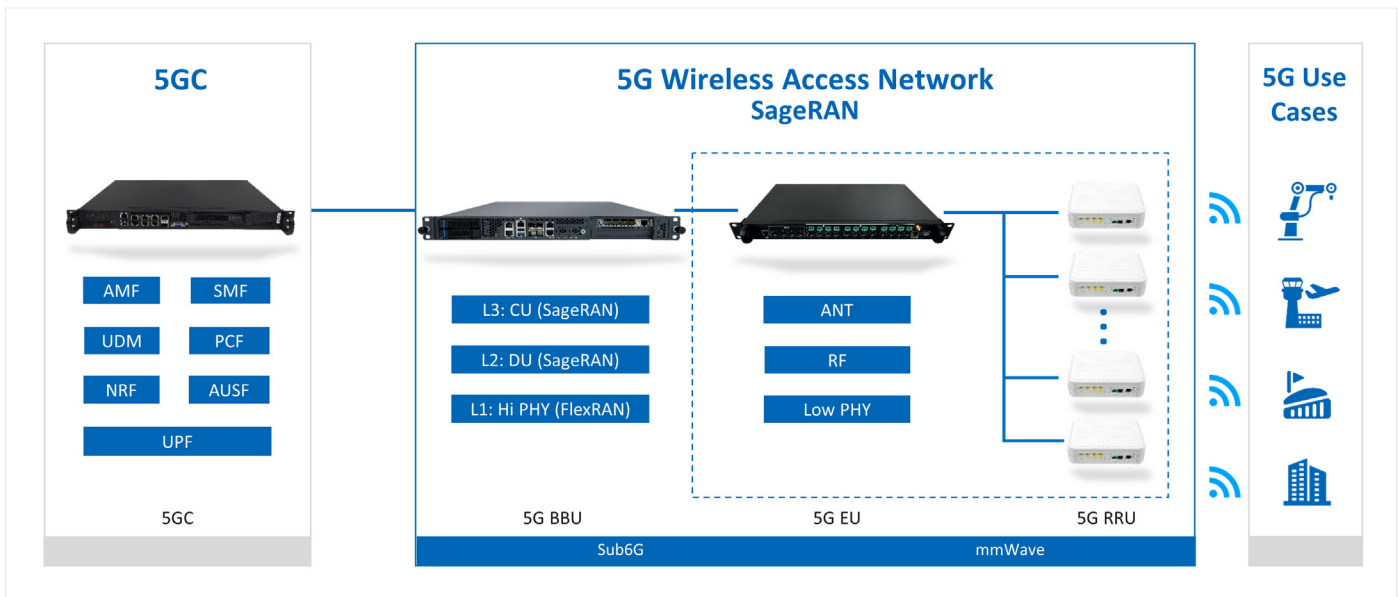
Figure 1. Block diagram of 5G gNodeB and 5G core network solution.

Open RAN offers open application programming interfaces (APIs) and multi-vendor interoperability, attractive features for enterprises that need to develop flexible and highly responsive networks. Moreover, Open RAN supports an existing and growing ecosystem of companies and products designed for Open RAN environments, adding functionality that is limited or unavailable in proprietary options. SageRAN is a member of the O-RAN Alliance, a global organization that develops Open RAN standards and advocates for the open approach to network building.

SageRAN Complete Private 5G Solution

SageRAN has developed a solution that accelerates the move to a private 5G network, giving MNOs or system integrators the technology they need to simplify the installation and operation of the network.

The SageRAN solution offers a complete 5G system including a 5G core and Open RAN including remote radio units (RRUs). As seen in Figure 1, this solution uses a server based on Intel Xeon® D-1700 processors for compute. The company built its

5G RAN Protocol Stack Solution on a carrier-grade Open RAN platform supporting a flexible split between centralized units (CU) and distributed units (DU). It is similarly flexible with the control plane (CP) and user plane (UP). It complies with Third-Generation Partnership Program (3GPP) specifications. The SageRAN solution supports the 3GPP's specifications in both standalone (SA) and non-standalone (NSA) modes.

Interoperability with network components from multiple vendors is necessary for a private 5G network, and the SageRAN solution provides a cost-effective way to accomplish it. This solution agility provides a high degree of flexibility, enabling the solution to be effective across a wide range of deployments and architectures. It works as well on third-party infrastructure (neutral host) as on a self-contained private 5G network.

The solution supports both distributed and centralized compatibility models. Enterprises can configure it to meet the protocol stack deployment of small-capacity integrated base stations or a large-capacity CU-DU split, enabling it to support networks of any size.
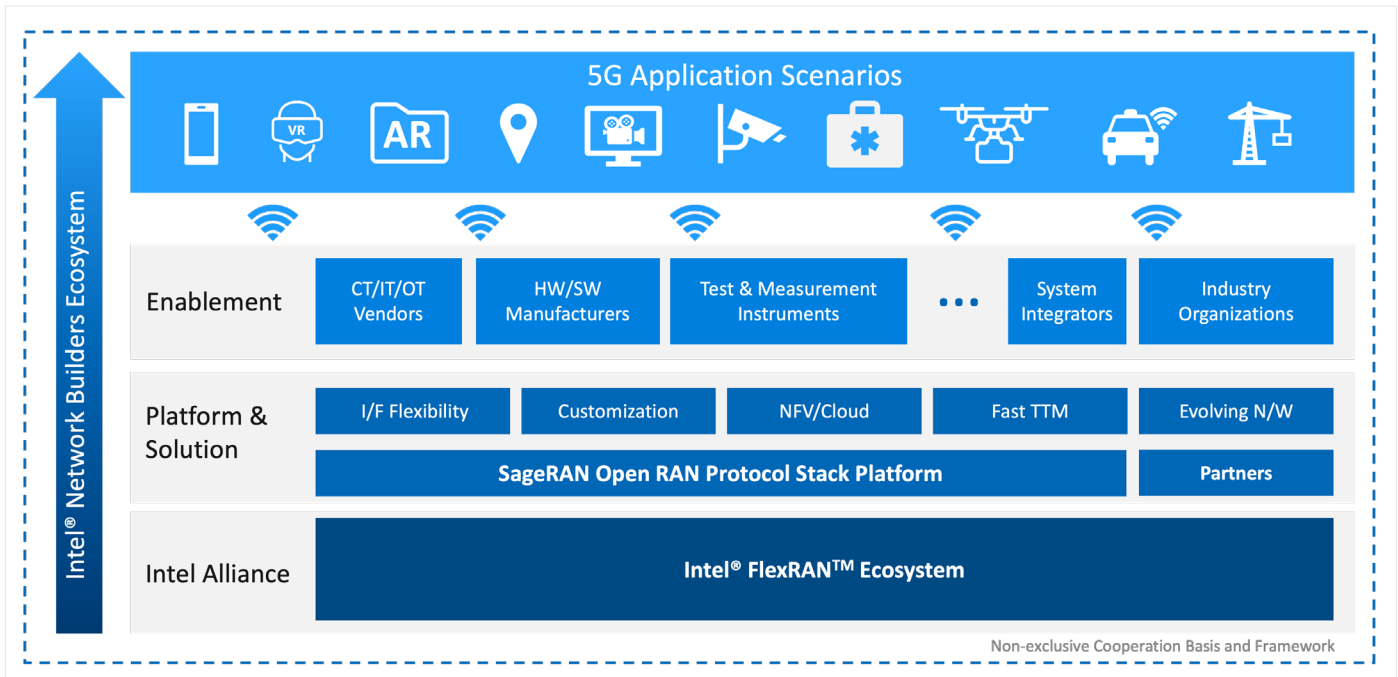
Figure 2. SageRAN's Collaboration with Intel® Network Builders Ecosystem

SageRAN's Evolution Towards Open RAN

Open RAN is designed for building virtualized RAN (vRAN) with artificial intelligence (AI) to manage and control the network. For carriers that are not yet ready for AI, an Open RAN architecture can enable its easy integration in the future.

The SageRAN 5G RAN Protocol Stack Solution amplifies Open RAN's support of virtualization. It automatically manages dynamic computing resource allocation and migration, which enables it to put processor cores into service where they are needed, moving them from one application to another as demand dictates.

The solution reduces energy consumption and increases hardware utilization, making the network more efficient.

High-Performance Hardware from Intel

SageRAN offers a rack-mounted 5G baseband processing unit powered by an Intel® Xeon® D-1700 family of processors.

The Intel Xeon D-1700 CPU family is designed for compact server solutions for indoor, outdoor and ruggedized environments where space and power are essential elements of the system design.

The Intel Xeon D-1700 processor family scales up to 10 cores. The CPUs are based on a ball grid array (BGA) substrate that delivers best-in-class feature set per Watt compared to previous Intel Xeon D SoCs. The Intel Xeon D-1700 processor family features integrated Ethernet, which scales up to 100Gbps. The processor family provides up to 16 lanes of PCIe Gen 4 and 24 lanes of PCIe Gen 3 of total data transfer.

The SageRAN solution makes use of the onboard Intel® Quick Assist Technology (Intel® QAT) crypto and compression acceleration. The CPUs also feature Intel Software Guard extension (SGX) to ensure data is safe even while in motion.

SageRAN has also announced a "suitcase"- based basestation with a target market of global MNOs, small and medium-sized equipment manufacturers, communication enterprises and system integrators. The highly integrated, all-in-one system features three servers: the 5G RAN (CU/DU), the 5G core and an application server.

Intel® FlexRAN™

Intel® FlexRAN™ is 4G and 5G baseband PHY reference software, which uses Intel architecture CPUs. The software enables the use of the Open RAN ecosystem to build and deploy highly optimized, feature rich, 4G and 5G scalable cloud-native RAN solutions. FlexRAN provides complete PHY functionality with superior performance. FlexRAN is also lower cost than many alternatives, reducing overall TCO of the hardware and software combination.

Working with FlexRAN, SageRAN has created and tested a solution for mmWave frequency applications. The solution uses the SageRAN 5G protocol stack running in standalone network mode at 26 GHz (band N258). The tests shows single carrier system bandwidth of 200 MHz, with downlink bandwidth of 1.2Gbps and low latency as measured by the packet round trip time (RTT) of 2 ms.[2]

Conclusion

Private 5G networks are key enablers of industry 4.0 and other communications initiatives. They enable industrial internet of things (IIOT) sensors to communicate with one another almost instantly and allow AI implementations to make decisions using real-time data. Robotic systems, sensors, control systems and self-monitoring components rely on the high reliability and low latency that private 5G provides.

However, complexity is an unavoidable aspect of implementing private 5G. Requiring a large number of small cells, deployed in specific and unique configurations to ensure they are routing signals properly, creates complexity for growing private 5G networks.

SageRAN's 5G RAN Protocol Stack Solution eases some of this complexity by facilitating interoperability of equipment from multiple vendors. Relieved of the necessity to integrate components manually, organizations can deploy private 5G networks faster and at lower cost.

Learn More

SageRAN 5G RAN Protocol Stack Software

Intel® Network Builders

Intel® Xeon®-D processors

Intel® Xeon® Scalable processors

Intel® FlexRAN™

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