

Robin, Supermicro Develop Cloud Native 5G Solution for MNOs

With Intel® Smart Edge toolkit and 3rd gen Intel® Xeon® Scalable processors, Robin and Supermicro deliver 5G RAN cloud-native automation platform that is hyper automated and deployable at scale



Mobile network operators (MNOs) are building their 5G network infrastructure with a new emphasis on cost effective performance. Thanks to cloud native virtualization, the 5G radio access network (RAN) can be built using industry standard servers, remote management and automation, and open interfaces that can drive increased competition and innovation in elements of the RAN.

These trends not only reduce capital expenses, but operating expenses as well. The 5G infrastructure can support the automated and remote installation of software updates as well as commissioning new services to meet peak traffic levels, and decommissioning those services during off-peak periods.



Another driving factor in the need for cost effective networks is an expectation that more small cells will be needed as part of the infrastructure. To get higher bandwidth, 5G services use higher frequency radio bands that have a shorter signal range. So macrocells used now for 4G services will be augmented by small cells. Some industry estimates show that 50 base stations will be required per square kilometer to meet the speed and coverage requirements of 5G.¹ By comparison, a macrocell's signal range is up to 25 km.



To manage this infrastructure dynamic successfully will take hardware platform flexibility. The network edge must support a wide range of virtual workloads from routing, and network security to 5G RAN. Multiple server platform options are required to maintain cost effectiveness in the face of this workload diversity.

Optimized virtualized platforms that feature extensive management and automation are also important in order to support the increased number of base stations expected to be deployed without a significant increase in maintenance staff.

Using hyper automation, which allows the MNO to remotely control the entire software and hardware stack, offers force-multiplying network management in comparison to traditional automation that is focused on a single or a limited aspect of the 5G software stack. With hyper automation, MNOs are able to achieve "one-click" service delivery and deployment in order to rapidly scale the network.

Two companies that have tested a complete 5G RAN foundation are Intel® Network Builders ecosystem partners Robin and Supermicro. Together, the companies have developed integrated hyper automation-based cloud-native platforms that leverage 3rd generation Intel® Xeon® Scalable processors. These RAN systems enable MNOs to scale 5G deployments with automation of all aspects of system management and life cycle management saving CAPEX and improving efficiencies.

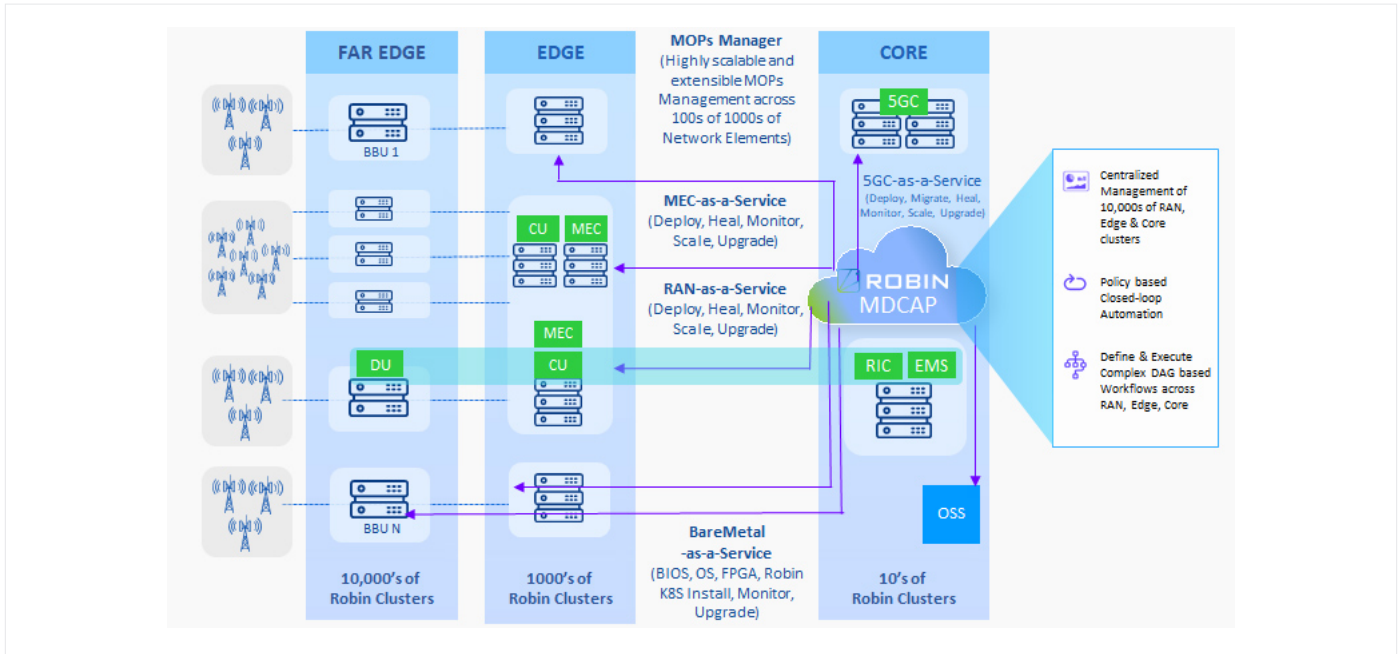


Figure 1. Robin CNP and MDCAP block diagram with deployments from the far edge to the core network.

Robin Technologies Provide Cloud Environments and Automation

Robin’s core technologies include its Cloud-Native Platform (CNP) and Multi Data Center Automation Platform (MDCAP) (see Figure 1) that work together to provide hyper automation cloud-native service delivery and management for 5G applications. Both software packages are designed to utilize minimal compute resources. This allows MNOs to deliver their applications and network functions “as-a-service” with one-click deployment simplicity. The Robin solution removes complexity, accelerates deployment times and significantly reduces OPEX and CAPEX costs compared to non-integrated solutions.

Robin CNP is an enhanced Kubernetes distribution platform with capabilities to support efficient deployment and life cycle management of container and virtual network functions (CNFs and VNFs). The platform empowers application deployment from a self-service app store in minutes, without relying on infrastructure teams that can often require weeks to source and install single-function network appliances.

The platform can be deployed on bare-metal servers or virtual machines on-premises or on any public cloud and can host radio access network (RAN) distributed unit (DU) and centralized unit (CU) functions, 5G core functionality and edge applications at scale. The platform combines application-aware storage, virtual networking, and application workflow automation built on Kubernetes.

The MDCAP is an end-to-end orchestrator that automates deployment and life cycle management of a very large number of clusters and devices and provides key operational services including metal-to-service orchestration. MDCAP can enable RAN-as-a-service, core-as-a-service, bare metal-as-a-service and a method of procedures (MOPs) manager that can auto-perform thousands of tasks with one click or one API call.

The CNP is hosted in far edge, edge and central data centers and the MDCAP manages the service orchestration and life cycle management of all of the data centers from the central data center.

Intel® SmartEdge Open is a cloud-native software toolkit that enables simplified orchestration and management of edge services across network platform and access technologies. Robin has incorporated Intel SmartEdge Open in its stack on top of Supermicro servers in such a way that these servers are not only deployable at scale, but also hyper automated.

Supermicro Cloud Native Optimized Servers

The Supermicro SuperServer product family is a comprehensive line of servers, storage systems, and subsystems that support a wide variety of application-optimized solutions from high-end clusters to microservers. They are designed to optimize performance per watt, per square foot and per dollar. Their high level of quality and performance has made SuperServers the platform of choice for high performance computing (HPC), enterprise, cloud, data center, hyperscale, embedded, and business-critical, front-end server applications.

The two servers chosen for this application include the 2RU-high SuperServer SYS-210P-FRDN6T (see Figure 2) which is optimized for use in 5G micro cellular outdoor cabinet deployment scenario where it can be used in networks requiring an onsite DU, or DU and CU.

The server supports a single socket 3rd generation Intel Xeon Scalable processor with up to 38 cores. It supports up to 2 terabytes of memory, up to six expansion slots for PCIe 4.0 peripherals. For uptime, the server supports four field-replaceable heavy duty fans and redundant 48V power supplies. For network connectivity, the server features two 1/10GbE ports and four 1GbE ports. With a depth of 300mm, this server is size optimized for many legacy outdoor cabinets.

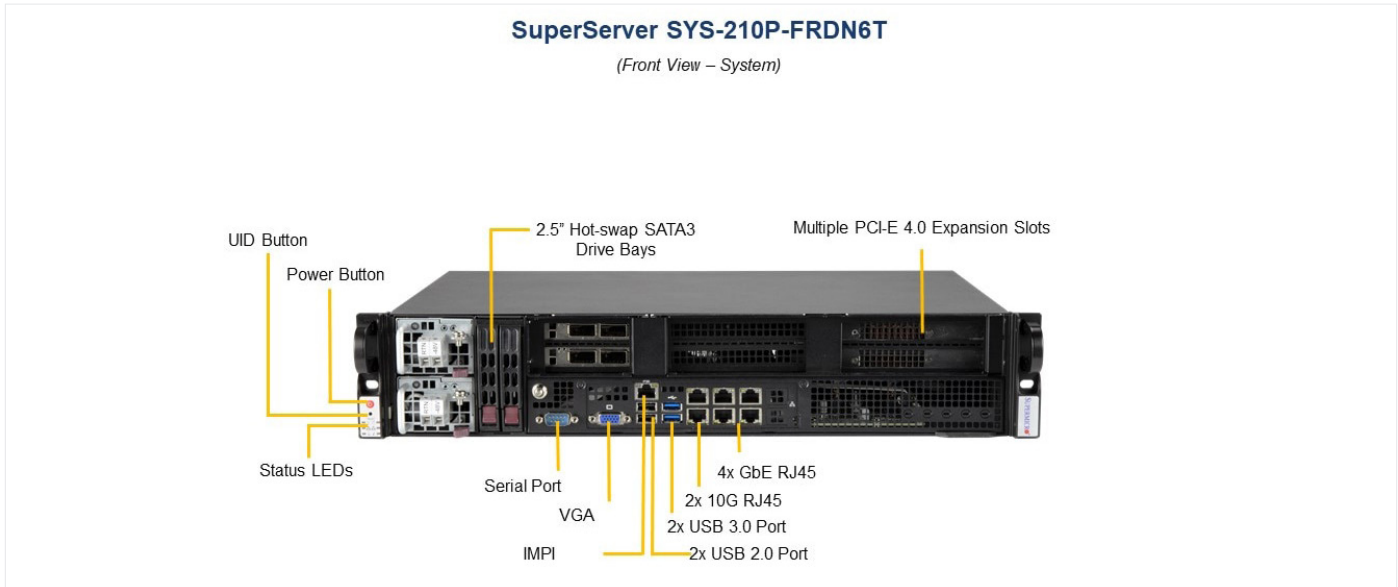


Figure 2. Front panel view of the Supermicro SYS-210P.

Another server recommended for the Robin-enabled 5G RAN edge computing applications is the 1RU-high SuperServer SYS-110P-FDWTR (see Figure 3). This server is a single socket system that can support 3rd generation Intel Xeon Scalable processors up to 32 cores with up to 2TB of RAM and dual built-in 10GbE networking ports. The server also features 6 heavy duty fans with optimal fan speed control and redundant 48V power supplies.

The server includes three PCIe 4.0 expansion slots for connectivity to high-speed network adapters or other peripherals. For both of these systems, these expansion slots could be used for Intel® vRAN Dedicated Accelerator ACC100 which provides 4G and 5G forward error correction (FEC) acceleration for higher capacity vRANs.

Intel Technologies Provide Performance, Security Features, Visibility

Supermicro Servers are based on 3rd generation Intel Xeon Scalable processors that offer a balanced architecture that delivers performance along with built-in advanced security capabilities that allow enterprises to place workloads where they perform best--from edge to cloud. The CPUs are architected for deterministic performance and high performance per watt. For organizations ready to drive 5G networking to the next level, these CPUs offer increased 5G user plane function (UPF) performance vs. the prior generation.²

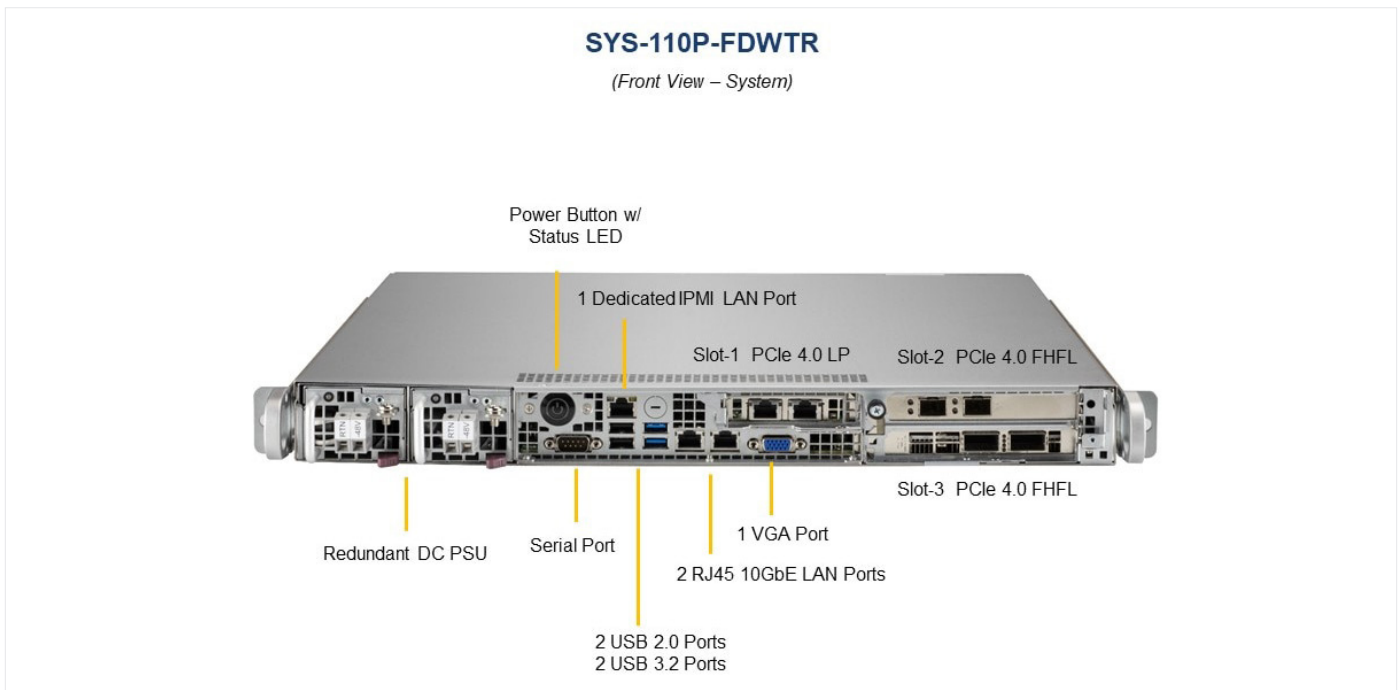


Figure 3. Front panel view of the Supermicro SYS-110P server.

The networking optimized CPUs used in SuperServers are designed for high-performance, low-latency layer 3 forwarding using Intel-developed, open source Data Plane Development Kit libraries. This throughput performance is essential for 5G user plane forwarding, virtual evolved packet core, vector packet processing, IPsec, virtual broadband network gateway and virtual cable modem termination system workloads.

The processors also support Intel Advanced Vector Extensions 512 (Intel® AVX-512) an instruction set that speeds up data packet cryptography processing to improve security functionality. In tests by Intel, a 3rd gen Intel Xeon Scalable Processor-based system achieved up to 1Tbps of IPsec traffic using AVX-512.³

For connecting to high-speed networks, the systems make use of Intel Ethernet Network Adapter E810. This adapter features dual 100 Gbps ports with support for PCIe 4.0 that can increase throughput for virtualized data flows. Key features of the network adapter include:

- Intelligent Flow Direction: Receiver Side Scaling (RSS)
- Comprehensive Network Virtualization Overlay Protocols Support
- vSwitch Assist

- QoS: Priority-based Flow Control (802.1Qbb)
- Enhanced Transmission Selection (802.1Qaz)
- Differentiated Services Code Point (DSCP)
- Dynamic Device Personalization (DDP)

In addition, Robin and Supermicro leverage Intel Platform Firmware Resilience (Intel® PFR), an Intel FPGA-based solution, to reduce firmware-related security risks.

For edge management of Kubernetes, the servers can be loaded with Intel® Smart Edge software toolkit and a commercial edge software that enables highly optimized and performant edge platforms to on-board and manage applications and network functions with cloud-like agility across any network.

Delivering Hyper Automation

The combined hyper automation capability from Robin and Supermicro supports virtual machine and container coexistence to enable resource sharing and unified automation. It provides an entire MNO network stack, with both CNFs and VNFs for 4G and 5G services such as core network, vRAN and content delivery networks.

Telefonica Uses Supermicro for RAN

In its whitepaper called “Telefónica views on the design, architecture, and technology of 4G/5G Open RAN networks⁴,” Telefonica uses Supermicro servers as examples of the server features needed for 5G RAN distributed unit (DU) applications. Figure 4, which Supermicro developed for the whitepaper, shows a server that needs the performance to run real-time RAN functions and support for a fronthaul interface to connect to the radio units.

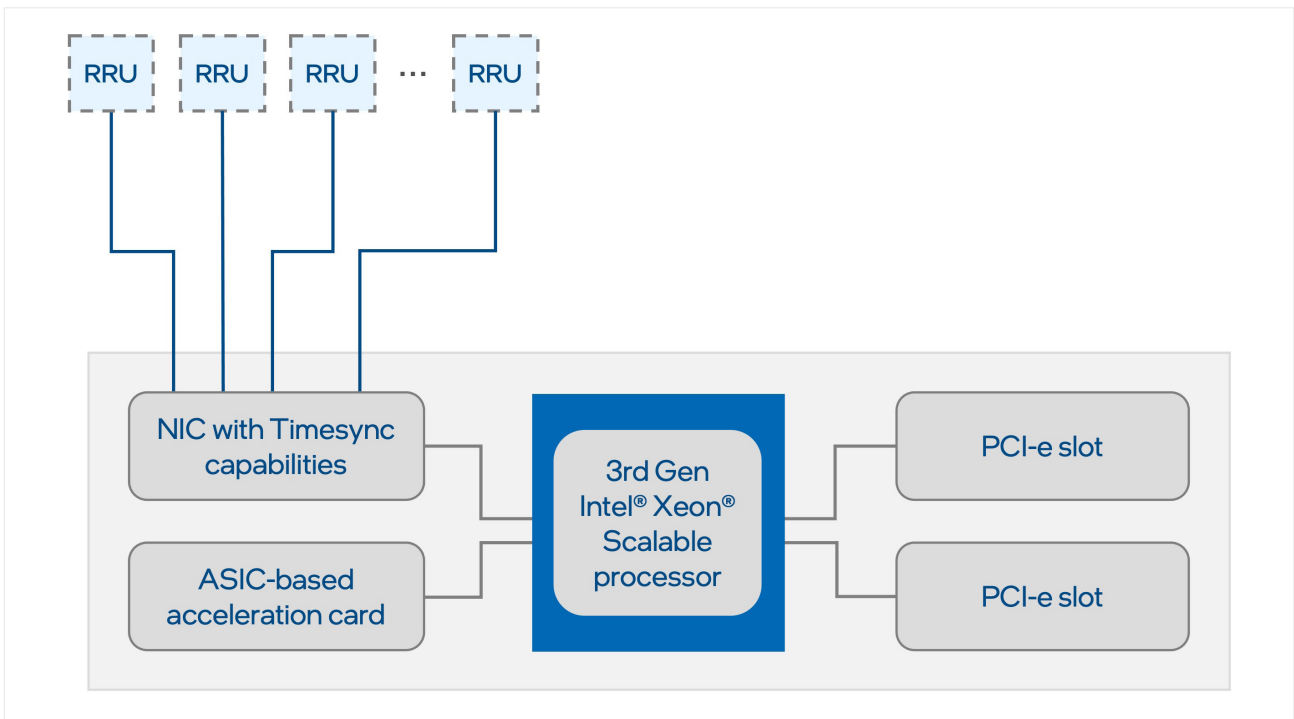


Figure 4. Illustration provided by Supermicro for Telefonica 5G whitepaper.

Robin software, on Supermicro servers, can orchestrate, and instantiate and manage applications with network intensive requirements such as Open RAN CU/DU as well as edge and MEC applications. Robin MDCAP can deliver bare metal-to-service orchestration at scale using Supermicro's bare metal API to automate infrastructure delivery and lifecycle management at hundreds of thousands of nodes, including deployment and configuration of Intel accelerators and real time operating system and network interfaces required.

When a workload is created to be used in a base station, for example, the workload is executed using the bare metal API from Supermicro that can all be tracked using the bare metal manager, without any intervention from the MNO. When a new piece of hardware is added to the network, it is automatically included in the inventory, and all the steps that are part of the workload are automated in the Robin MDCAP.

Conclusion

MNOs are focused on cost effective 5G network buildouts and are making the most of cloud-native virtualization, hyper automation and high-performance industry standard servers. With the Robin, Supermicro and Intel solution for these networks, MNOs can leverage hyper automation to deploy applications and server functions quickly. By automating complexity and accelerating deployment, the solution significantly reduces OPEX and CAPEX costs and allows MNOs to keep pace with the fast-changing needs of new 5G networks.

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[Supermicro SuperServers](#)

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¹ <https://techblog.comsoc.org/2020/08/07/5g-base-station-deployments-open-ran-competition-huge-5g-bs-power-problem/>

² <https://www.intel.com/content/dam/www/public/us/en/documents/performance-briefs/a1166943-3rd-gen-xeon-5g-core-performance-security-brief.pdf>

³ <https://networkbuilders.intel.com/solutionslibrary/3rd-generation-intel-xeon-scalable-processor-achieving-1-tbps-ipsec-with-intel-advanced-vector-extensions-512-technology-guide>

⁴ <https://www.telefonica.com/documents/737979/145981257/Whitepaper-OpenRAN-Telefonica.pdf/3a160ca9-c325-a3d6-a6da-f9453616144d>

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