5G NR Distributed Unit (DU) Solution Based on O-RAN

Supermicro and Altiostar together can provide a complete open architecture reference model based on O-RAN, using best-in-class hardware and software.

Figure 1. *Altiostar/Supermicro O-RAN Solution*

Executive Summary

5G is disrupting the mobile telecom network. To realize eMBB, URLLC, and mMTC, the top three use cases for 5G, mobile operators have to redesign their networks. Supermicro and Altiostar are leading the way to provide state-of-the-art platforms running best-in-class software infrastructure to ease the ability to deploy, manage, and orchestrate the mobile network.

Solving the Challenges of 5G Networks

One major change in 5G is the New Radio (NR). It will use much higher radio frequencies to achieve higher bandwidth required for the huge increase in connected devices and new use cases. Since higher frequencies will have shorter transmission range, more base stations will be required to cover existing areas. On top of this challenge, suppliers for Radio Area Network (RAN) equipment have been limited to a handful of large international companies with proprietary solutions. Mobile network evolution has been slow while many innovations have happened with Internet and Cloud software.

Service providers are migrating to open architecture-based RAN solutions for the transition to the 5G era. An open, cloud-native RAN concept has quickly gathered lots of interest and top global operators have formed the O-RAN alliance. O-RAN's mission is to build a new 5G RAN on a foundation of virtualized network elements, white-box hardware, and standardized interfaces that fully embrace O-RAN's core principles of intelligence and openness. As a contributing member of O-RAN, Supermicro is fully committed to contribute and deliver this solution.

Altiostar is a software vendor that provides 5G-ready virtualized RAN solutions supporting open interfaces and a disaggregated hardware/software solution to build a multi-vendor web-scale network. Altiostar's OpenRAN software suite with open interfaces provides a high degree of programmability and automation. The combination of Altiostar's open software platform and Supermicro's commercial off-the-shelf (COTS) edge servers provides a reliable, flexible, scalable, and cost-compatible solution to realize the new RAN.

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Supermicro's new 1019P-FHN2T and E403-9P-FN2T servers bring 2nd Gen Intel® Xeon® Scalable processors to the 5G NR RAN. They include the ability to support 2 or 3 PCI-E expansion cards for FH and MH interfaces.

Figure 2. *1019P-FHN2T for controlled environments*

Figure 3. *E403-9P-FN2T for deployment in more demanding environments*

The Altiostar/Supermicro Solution

Specifically, for the Distributed Unit (DU), the combined solution can support LTE or 5G with baseband functions decoupled from the hardware and deployed on network functions virtualization (NFV) infrastructure. RAN cloudification is one of the fundamental tenets of the O-RAN architecture. The operators' NFV and virtual infrastructure manager (VIM) requirements enhance virtualization platforms in support of various functional splits from 3GPP.

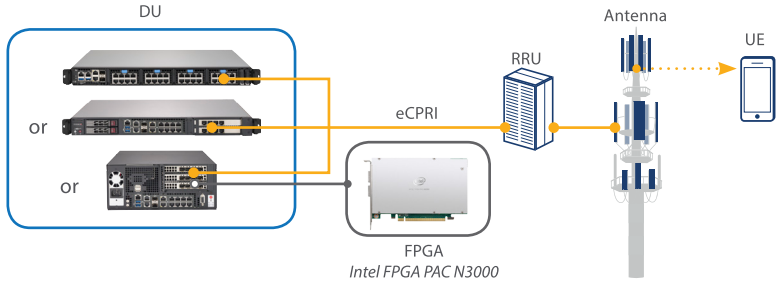

Figure 4. *DU reference design for O-RAN White Box*

The RAN DU sits between the Remote Radio Unit (RRU) and the Central Unit (CU) and includes real-time L2 functions, baseband processing, and radio frequency processing. Currently, Supermicro's Xeon D-based 1019D-FHN13TP server is being proposed in a draft configuration for the DU in O-RAN's white box working group. In this configuration, the DU will support 3 sectors of RRUs via a RIM card from Altiostar. The RIM card will provide CPRI-to-eCPRI conversion so that the baseband and radio frequency information can be transmitted over the IP network.

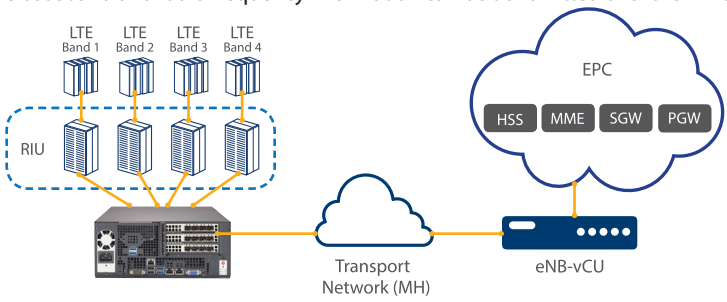

Figure 5. *2nd Gen Intel® Xeon® Scalable processor-based high-density deployment*

In Figure 5, the DU will support 12 sectors of RRUs with multiple LTE bands, requiring a large amount of digital signal processing in real time to perform the CPRI-to-eCPRI conversion. This task can be offloaded to an FPGA card, specifically the Intel® FPGA Programmable Acceleration Card N3000. This card accelerates network traffic up to 100Gbps to support low latency and high bandwidth tasks such as FEC acceleration at the PHY layer.

Conclusion

Supermicro and Altiostar are working together to provide a cloud-native total solution for DU based on open architecture, open APIs, and open-hardware servers, benefiting from cloud computing innovations such as SDN, virtualization, and containerization. The benefits of FPGA plus x86 CPUs are exceeding early expectations on improving the LTE/5G workload using virtualized infrastructure. This scalable design will allow operators to have the flexibility to design their network, enable software-only remote upgrades to following generations, and make continuous implementation and deployment a reality.