

6WIND and Kontron Team Up for Open vRAN Integrated DU Solution

New distributed unit (DU) solution combines Intel® Xeon® D-2700 family processor-based server from Kontron featuring built-in switch and timing for Open vRAN, with full-featured virtual cell site router (vCSR) from 6WIND.



The radio access network (RAN) is the most expensive part of a mobile network, with some analysts estimating it comprises up to 70% of the cost of the mobile infrastructure¹. The move to open virtualized RAN (Open vRAN) is helping to reduce these costs. Open vRAN takes the formerly monolithic baseband unit (BBU) and decomposes it into a distributed unit (DU) and a centralized unit (CU). The DU processes real time layer 1 and 2 information, the CU processes the non-real time data.



This disaggregation is where the costs can be reduced. Where a BBU was installed at each base station, now only a DU is required at the base station – with the CU serving multiple base stations. Also, the use of open interfaces introduces competition between vendors that can result in reduced capital outlays. The use of Open vRAN is gaining traction for 5G networks especially in cost-sensitive deployments such as private 5G networks that provide wireless connectivity in an office building or factory floor.



The CU supports layers two and three of the protocol stack, including the service data adaptation protocol (SDAP), packet data convergence protocol (PDCP) and radio resource control (RRC). The DU processes baseband and RF function processing of the physical layer and layer 2 processes including radio link control (RLC) and media access control (MAC).

The processing intensive nature of the DU requires a special commercial-off-the-shelf (COTS) platform to obtain the real-time performance of these protocols. It also is typically located at or near the base station radio units (RUs) to reduce transport latency by using a fiber-optic connection and the open evolved Common Public Radio Interface (eCPRI) protocol to the remote radio head (RRH). With enough performance, the DU can provide specialized services such as coordinated multipoint (CoMP) a special multiplexing capability that increases system capacity.

6WIND and Kontron Team Up for DU Platform

Intel® Network Builders ecosystem partners 6WIND and Kontron have teamed up on a high performance, integrated DU platform that combines a server from Kontron powered by Intel architecture processor, a 12-port switch and timing synchronization paired with a full-feature virtual cell site router (vCSR) from 6WIND. This system is designed to run any Open vRAN DU software and solves a number of key challenges for mobile operators – including eliminating the dedicated hardware-based CSR which reduces the footprint, cabling, power consumption and heat dissipation. It furthermore simplifies and accelerates implementation, operations and maintenance, and thereby pares down operating costs.

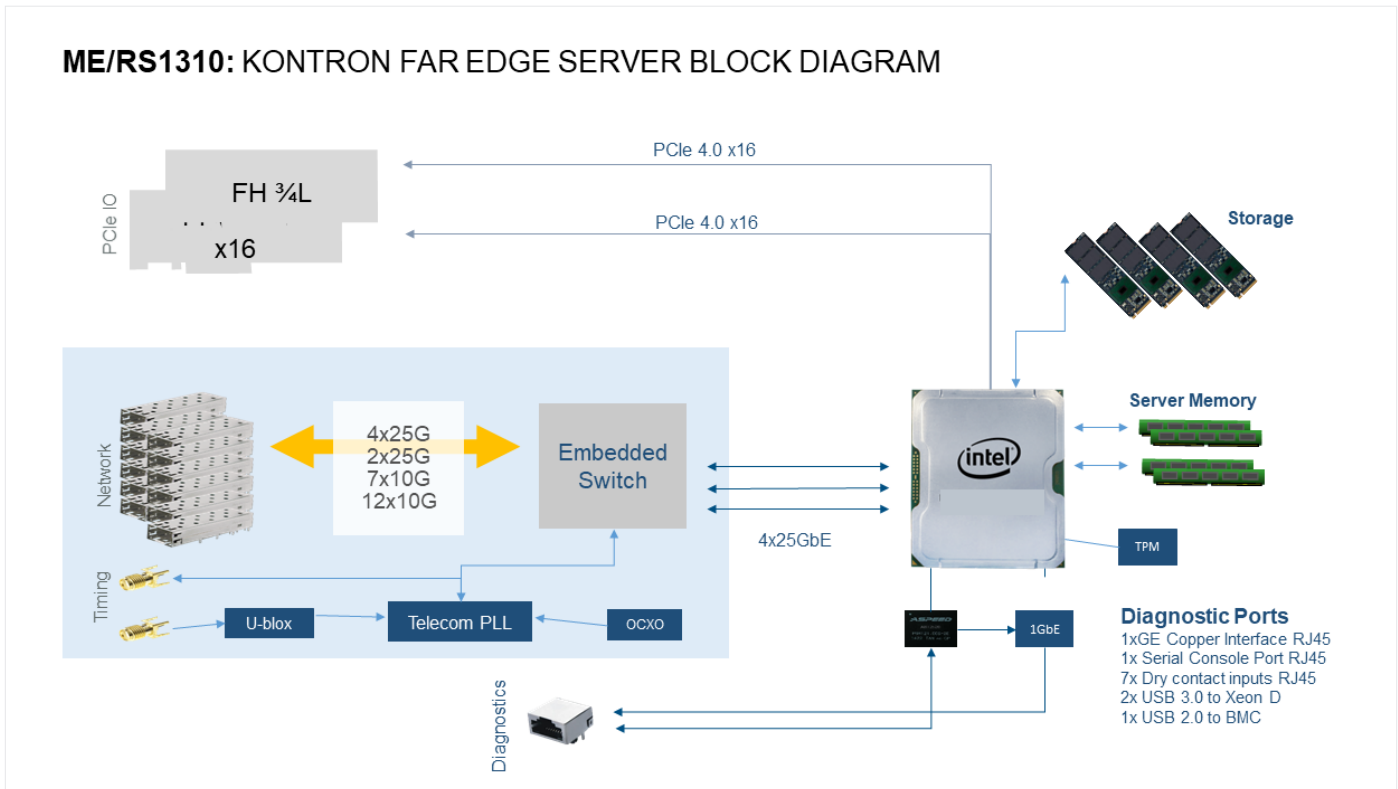


Figure 1. Block diagram of Kontron ME1310 mobile edge server.

Kontron ME1310 Far Edge Server

The Intel® Xeon® D-2700 family-based Kontron ME1310² is the next in a line of Kontron mobile edge platforms designed to optimize the deployment of Open vRAN. The server leverages Kontron's more than four years of OpenRAN market experience and ISV partnerships resulting in a unique product design that delivers wide operating temperature range, support of harsh environments and support for AC/DC power. The ME1310 is also available in a hardened passively cooled, IP-65 sealed enclosure (named RS1310³) to support deployments directly into an outdoor setting (including pole mount).

The new high performance platform caters to MNOs who seek hardware that uses COTS parts, but is designed to deliver on the Open vRAN promise of network elasticity and a fully virtualized cloud RAN architecture.

The ME1310 is powered by Intel Xeon D-2700 family processors with up to 20 cores - a 25% increase in cores compared to the previous generation of the CPU. This increased core count allows for more sectors/radios to be supported by a single Kontron ME1310. In some applications, customers have deployed up to 12 sectors with the previous server model and Kontron believes that the increased core count in the Intel Xeon D-2700 family processors can support up to 25% more sectors.

The Intel Xeon D-2700 processor family is designed for compact solutions for indoor, outdoor and ruggedized environments and scales up to 20 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-2700 processor family features integrated Ethernet, which scales up to 100Gbps. The Xeon D-2700 processor family provides up to 32 lanes of PCIe Gen 4 and 24 lanes of PCIe Gen 3 delivering a total of 56 high speed IO lanes for data transfer.

This I/O capacity is used by the Kontron system to support two PCIe Gen 4 x16 3/4LFF card slots for high-speed acceleration cards including the Intel® vRAN Dedicated Accelerator ACC100 for 5G forward error correction acceleration and the Intel® FPGA PAC N3000 smart network interface card (NIC). The SmartNIC accelerates network traffic up to 100 Gbps to support low-latency, high-bandwidth 5G applications.

The improvements to the Intel® Advanced Vector Extensions 512 (Intel® AVX-512) in the Intel Xeon D-2700 family CPU have a big impact on the virtualized networking within the server as it boosts data plane development kit (DPDK) packet throughput and IP security (IPSec) performance when compared to previous generation products.

For acceleration of cryptography and compression operations, the ME1310 supports the on-chip Intel® QuickAssist Technology (Intel® QAT). Intel QAT accelerates symmetric encryption and authentication, asymmetric encryption, digital signatures, RSA, DH, and ECC, and lossless data compression.

Integrated Switching and Precision Timing

The Kontron ME1310 has a built in 12-port, 200 Gbps switch for fiber optic front haul connections. The switch features four SFP28 and eight SFP+ ports to support fiber-optic connections at 25 GbE or 10 GbE.

5G has low latency requirements necessitating that the DU hardware support high accuracy packet timing for the connection between the DU and the RRH/RU. The switch includes support for the most popular timing protocols to ensure low-latency connections between the DU and the RRH. These protocols include Synchronous Ethernet and IEEE 1588v2 Precision Timing Protocol in either master or boundary clock (BC) mode. The switch has several clock source options including an onboard oven controlled crystal oscillator (OCXO) supporting up to four hours of autonomous hold over time, and an input for global navigation satellite system (GNSS) synchronization with a pulse per second (PPS) output port.

The ME1310 server supports up to 512GB of DDR4 memory at 3200MHz. For storage, the server supports four M.2 low profile memory banks supporting up to 2TB of RAID storage. Kontron has built independent management into the server that includes support for the Redfish application programming interface (API) and Intelligent Platform Management Interface (IPMI) v2.0 Secure Remote Management Capabilities (encrypted firmware, boot, storage, secure boot, and failsafe boot). The server also uses the Intel® Trusted Platform Module (TPM 2.0) microcontroller that stores keys, passwords, and digital certificates.

Integrating Virtual Cell Site Routing into the DU Server

The 6WIND vCSR is a virtualized cell site router solution, part of 6WIND's Virtual Service Router (VSR) product family. The vCSR is tailored to the RAN needs of 5G and 4G mobile network operators. The primary purpose of the vCSR is to provide full IP/MPLS routing with very high efficiency, and high-performance end-to-end IPsec VPN security in a RAN for hauling aggregated traffic to the operator's core network.

The 6WIND vCSR is optimized to support all required CSR features and delivers its line-rate performance in a small CPU and memory footprint. This efficient and small footprint of the 6WIND vCSR allows the rest of the CPU and Memory resources to be dedicated to the DU and other needed functions.

Based on 6WIND's core technology, vCSR provides line-rate performance, linearly scalable forwarding performance on Intel® architecture hardware such as the Kontron ME1310. It also delivers very low and deterministic latency, which is of utmost importance for real-time low-latency 5G network applications.

The 6WIND vCSR is one of the applications provided by the company's Virtual Service Router, which supports a full range of routing protocols and is optimized for high-performance routing on Intel Xeon D-2700 family-based servers.

vCSR can be deployed on bare metal (PNF), virtualized (VNF) or containerized (CNF) with full hardware and software disaggregation. With support for private (KVM, VMWare ESXi) and public clouds (AWS, GCP, Azure).

The 6WIND vCSR has the following capabilities:

- Broad set of routing protocols: BGP, OSPF v2, OSPF v3, IS-IS, PBR, RIP and RIPng
- Fast route lookup implementation, allowing for top-notch performance, low convergence time and optimal routing decisions
- In the Kontron Open RAN DU solution, the vCSR runs as a virtual machine in a KVM environment.
- QoS: Traffic conditioning, shaping, policing and hierarchical QoS
- Security: ACL Support, DDoS protection through BGP FlowSpec
- Integrated high performance IPsec VPN support
- Device management

Figure 2 shows a cell site deployment scenario where the distributed unit (DU) aggregates multiple radio units (RU), the aggregated traffic is then backhauled to the provider edge and core. As a result of the 6WIND vCSR running on top of the Kontron ME1310 as a VNF, the need for a discrete hardware-based cell site router is eliminated. This reduces capital expenditure, simplifies deployment and operations for each cell site deployment.



Figure 2. 6WIND virtual cell site router in a typical cell site.

Conclusion

Open vRAN is changing the way wireless networks are deployed, with open interfaces, enabling CU/DU functions running on Intel architecture COTS servers. The Kontron ME1310 DU platform fitted with 6WIND vCSR software is a paradigm-shifting solution that minimizes hardware footprint while delivering full layer 2/3 switching and routing, and hardware features that are optimized for the application. Powered by the Intel Xeon D-2700 family processor, the Kontron and 6WIND solution offers a highly integrated platform for LTE/5G network deployments from public network to private enterprises.

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¹ <https://www2.deloitte.com/xen/en/insights/industry/technology/technology-media-and-telecom-predictions/2021/radio-access-networks.html>

² ME = media edge

³ RS = rugged server


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