Solution Brief

Mobile Network Operators
Virtualized RAN

Altiostar Open vRAN Solution Enables 5G Broadband for Rural Operators

Rural mobile network operators can leverage Altiostar's Solution with servers using Intel® Xeon® Processors to cost-effectively and flexibly upgrade network to close digital divide

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In today's society, people are increasingly working and learning remotely. This presents a number of challenges for mobile network operators (MNOs) globally, particularly for those in rural populations. In some rural communities, internet speeds in the home are too slow or too unreliable to support the higher connectivity needs of work from home and distance learning operations running simultaneously. In other rural communities, there may not be a broadband connection in the home at all.

To support these new working and learning environments, MNOs need to boost connectivity speeds in some homes. And in some cases, operators are challenged with provisioning low-cost or no-cost connectivity for the first time in some homes. If that is not possible, MNOs are establishing Wi-Fi hotspots to clusters of homes or in parking lots. All of this stretches rural wireless networks significantly.

While rural connectivity issues are being brought to the forefront now, the digital divide in rural populations has been a pain point for some time. Without evolving the network, rural communities have been left behind urban communities in their ability to access next-generation communications services, from internet of things applications to emergency services, for example.

With the exciting possibilities of 5G at the forefront of many MNOs' minds, rural MNOs are looking for ways to cost-effectively and flexibly upgrade their networks as they transition to 4G or 5G. Modernizing the network to deliver higher bandwidth and reliable coverage in order to keep existing customers happy and to grow their customer base is a high priority—allowing rural MNOs to have service quality that is competitive with their urban competitors.

But in rural communities, it can be difficult to cost effectively evolve the network due to low population density. The high cost of the radio access network (RAN) can be a stumbling block as it accounts for up to 70% of total network costs,[1] driven by operating costs associated with remote maintenance of legacy RAN systems, according to the O-RAN Alliance.

To cost effectively improve service, some MNOs may consider making upgrades to legacy RAN equipment in the interim. However, quick upgrades to legacy RAN equipment can tie a rural MNO to a high-priced and proprietary solution—postponing the pain of a costly update that will eventually come when they embrace 5G.

An alternative is a virtualized RAN (vRAN) solution based on an open architecture that can let rural MNOs expand their network with less CAPEX cost because the software runs on industry-standard servers powered by Intel® architecture CPUs instead of high-cost fixed-function appliances. This results in not only lower capital costs for the MNO, but also open interfaces capable of further disaggregating hardware from software, allowing an ecosystem to evolve capable of delivering a new breed of experience and service.

One perceived hold up to embracing a vRAN solution is the transport network. Some rural carriers have invested in fiber optics that can support a long distance, low latency link, but in other networks the transport is lower capacity, higher latency T1 or microwave wireless connections. This can be a challenge for vRAN solutions, which have a real-time data processing requirement that mandates high-speed networks.

vRAN solutions do offer the flexibility to split the two main baseband unit components—the distributed unit (DU) and the centralized unit (CU)—and flexibly deploy them to support a variety of transportation network options.

Intel® Network Builders ecosystem partner Altiostar has developed their Open vRAN software solution that enables rural MNOs to modernize their networks and cost-effectively deliver the scalability and flexibility needed to evolve to 4G and 5G connectivity.

Altiostar Virtualized RAN Solution

The Altiostar's Open Virtualized RAN (Open vRAN) software supports the O-RAN Alliance specifications around open interfaces to make possible a multi-vendor network. The company provides 4G and 5G vRAN software that supports indoor and outdoor macro and small cells.

Altiostar's 5G software is one of the first cloud-native vRAN solutions available and allows MNOs to break down network functions into containerized applications that are fast to deploy, can be individually upgraded, and offer better network scalability. The new Open vRAN software dramatically improves the economics, deployability, and scalability of 5G RANs.

The architecture enables advanced cloud-based networks that support new applications and services, advanced automation, and operational simplicity; enable advanced algorithms; and enhance quality of experience (QoE).

Altiostar's solution can be deployed into different virtualized and containerized environments with full flexibility on management and orchestration (MANO) layers. This allows MNOs to build out capacity based on factors such as transport infrastructure, population density, available RAN technology, and others.

RAN Models for Rural MNO Implementation

Altiostar offers several options for rural MNO implementation, each depending on the type of transport in place and the user population density. These options are based on the ability to split the RAN baseband unit (BBU) functionality between a centralized unit (CU) and distributed unit (DU). The BBU handles baseband processing and is connected to the mobile core over a backhaul network, and to multiple remote radio heads (RRH) through ORAN 7-2x links. The vDU and vCU functions are separate, which allows the MNO to move the workloads between data centers at the edge or at the central office—or even out to the base station—depending on the use case and the network transport.

The first model for rural MNOs, as shown in Figure 1, utilizes a vDU that is housed in a local data center that can be some distance from the remote radio heads (RRHs) because there is a low-latency fiber transport connection in place. The vCU can service multiple vDUs from a centralized data center where it is co-located with network core functionality. Because the vDU is in a data center, it can be in a fully virtualized environment with zero-touch, automated management.

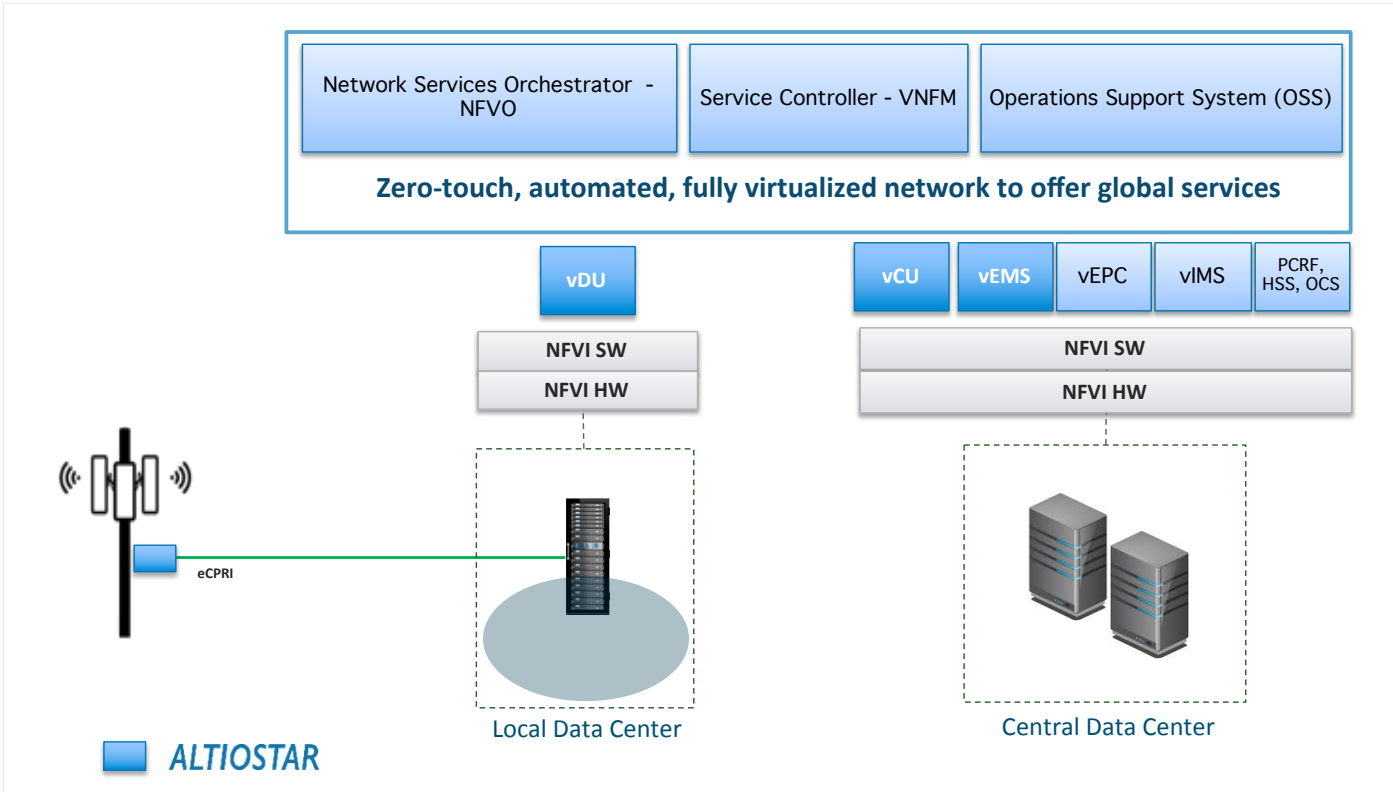

Figure 1. Model 1 diagram with vDU in a local data center that is served by a fiber-optic transport network.[2]

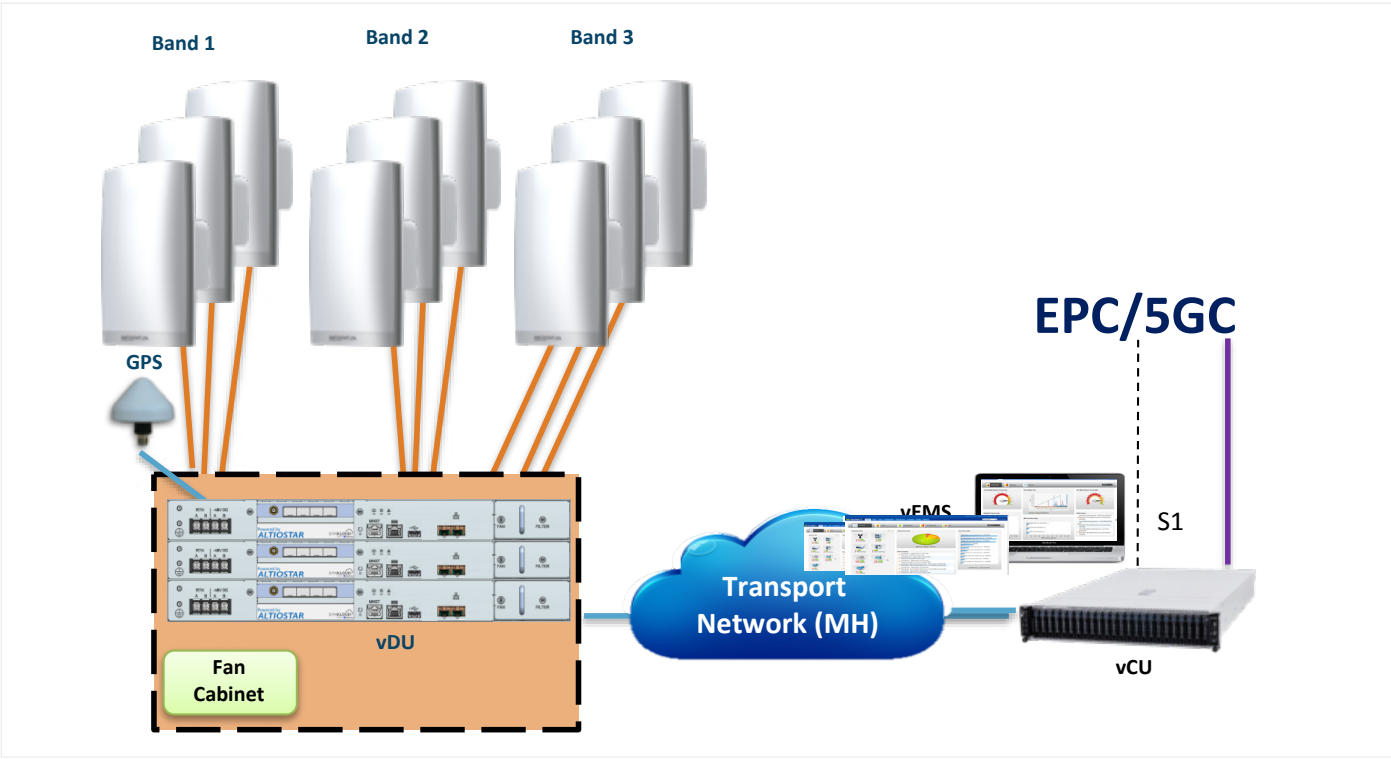

Figure 2. Higher performance server hosts vDU that can process data load of multiple RRHs.

The first model is developed for rural MNOs that have fiber transport in place, which is cost effective for a significant density of users. Other models may be more relevant for rural MNOs that serve low population density areas as they use Altiostar's scalability to be deployed on small and large servers in order to locate the vDU as close to the base station as possible.

The cost-effectiveness of this model is maintained by the cloud-based vCU, network core, and OSS/BSS services. The vDU, however, is not a part of the common virtualization infrastructure and will need onsite technical resources to fix any failures.

The model seen in Figure 2 involves deploying a higher-capacity vDU in an air-conditioned cabinet in a location that is close to a cluster of RRHs. This model provides the capacity to serve a cluster of remote radio heads still using only a DSL or microwave Ethernet link to connect the vDU to a cloud data center.

Depending on the number of RRHs served by this vDU server, it may benefit from extra processing power that the Intel® FPGA Programmable Acceleration Card (Intel® FPGA PAC) N3000 can offer. The Intel FPGA PAC is a highly customizable platform for multi-workload networking infrastructure and application acceleration. It has the right memory mixture designed for network functions, with integrated network interface card (NIC) in a small form factor that enables high throughput, low latency, low power per bit for custom networking pipeline.

Deployed on Intel® Processor-Based Servers

Altiostar utilizes servers for its Open vRAN solution deployments that utilize 2nd generation Intel® Xeon® Scalable processors or Intel Xeon D processors for performance and cost-effectiveness.

2nd generation Intel Xeon Scalable processors are the basis for building virtualized, cloud-optimized, 5G-ready network platforms. The CPUs offer an architecture that scales and adapts with ease to handle the demands of the convergence of key workloads, such as applications and services, control plane processing, high-performance packet processing, and signal processing.

Intel Xeon D processors bring the architecture of the Intel Xeon Scalable platform to a system-on-a-chip (SoC) processor for lower-power, high-density solutions, integrating essential network, security, and acceleration capabilities. The SoC is a software-programmable platform featuring robust virtualization support, with low latency, high-bandwidth capabilities through a flexible design, for a variety of solution and service deployments in space- and power-constrained environments. These SoC processors support high-density, single-socket network, storage, and cloud edge computing solutions.

Conclusion

Utilizing vRAN allows rural MNOs to build a cost-effective broadband wireless solution for a wide range of population density applications. The Altiostar Open vRAN solution has been proven on the world's largest networks, and can also be scaled and applied to deploy the smallest networks. Depending on the type of transport a rural MNO has in place, the model architectures detailed in this paper show there are different solutions to modernize the network through Altiostar's solution.

For More Information

Altiostar: www.altiostar.com

Intel® Xeon® processors: www.intel.com/xeon

Altiostar is a member of the Intel® Network Builders ecosystem: http://networkbuilders.intel.com

Notices & Disclaimers

[1] O-RAN Alliance, "O-RAN: Towards an Open and Smart RAN." October 2018. https://static1.squarespace.com/static/5ad774cce74940d7115044b0/t/5bc79b371905f4197055e8c6/1539808057078/O-RAN+WP+FInal+181017.pdf

[2] Figures provided courtesy of Altiostar.

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