

Solution Brief

Communication Service Providers & Mobile Network Operators



Private 5G uCPE Helps Service Providers Meet Enterprise Demand

Solution for private 5G combines RAN software from Accelleran, Intel®-based white-box appliances from Advantech, and virtualization software from Enea for flexible on-premises solution with compute headroom for more services



Enterprises are undergoing a continuous digital transformation as increasing competition is driving them to look for ways to reduce costs, improve supply chain reliability and manufacturing agility.



This digital transformation is impacting technology, data processing, manufacturing processes and organizational structures used by enterprises. It is driving increased use of artificial intelligence (AI), internet of things (IoT) and analytics. 5G cellular technology is a critical link to expanding enterprise digital transformation. Private 5G network services from communications services providers (CoSPs) promise fast throughput speeds, low latency and extensive connectivity making them ideal for IoT networks.



For enterprises, private 5G challenges include the need to hire new technical talent to build and maintain the network, and for those companies that are building their own network, the need to license spectrum. But working with a CoSP that offers private 5G managed services can be an easier way to deploy private 5G. A managed service will require an on-premises universal customer premises equipment (uCPE) server to run the real-time aspects of the RAN. But with the right server, the CoSP is able to deploy the 5G RAN along with other network, data security or digital transformation services.

Intel® Network Builders ecosystem companies Accelleran, Advantech, and Enea have come together to create a cost-effective turnkey radio access network (RAN) solution for private 5G deployments that allows CoSPs to deploy new services that enable enterprise, IoT and digital transformation applications. The solution includes the remote radio unit (RRU) as well as the software and Intel® architecture server that processes the radio signals. RAN software is composed of a distributed unit (DU), providing real time L1 and L2 scheduling, and a centralized unit (CU) for non-real time, L2 and L3 signal processing. RAN functions are virtualized and run on top of a cloud native (containerized) or network functions virtualization (NFV) software stack.

Complete Solution

Figure 1 shows the complete private 5G solution. The Accelleran E1000 connects to the antenna and provides dRAX RRU and DU services. In Figure 1, these both reside in the E1000, but depending on the distances involved, the DU could be run on the Advantech FWA-5070 that uses Enea Edge for the virtualization infrastructure. A virtual firewall also runs on the COTS server, which has enough compute power to also support a virtual enhanced packet core (vEPC), but in this example that processing is done in another server outside of the solution. A key component is the Accelleran RAN Intelligent Controller (RIC) that provides real-time control capabilities for all of the RAN elements.

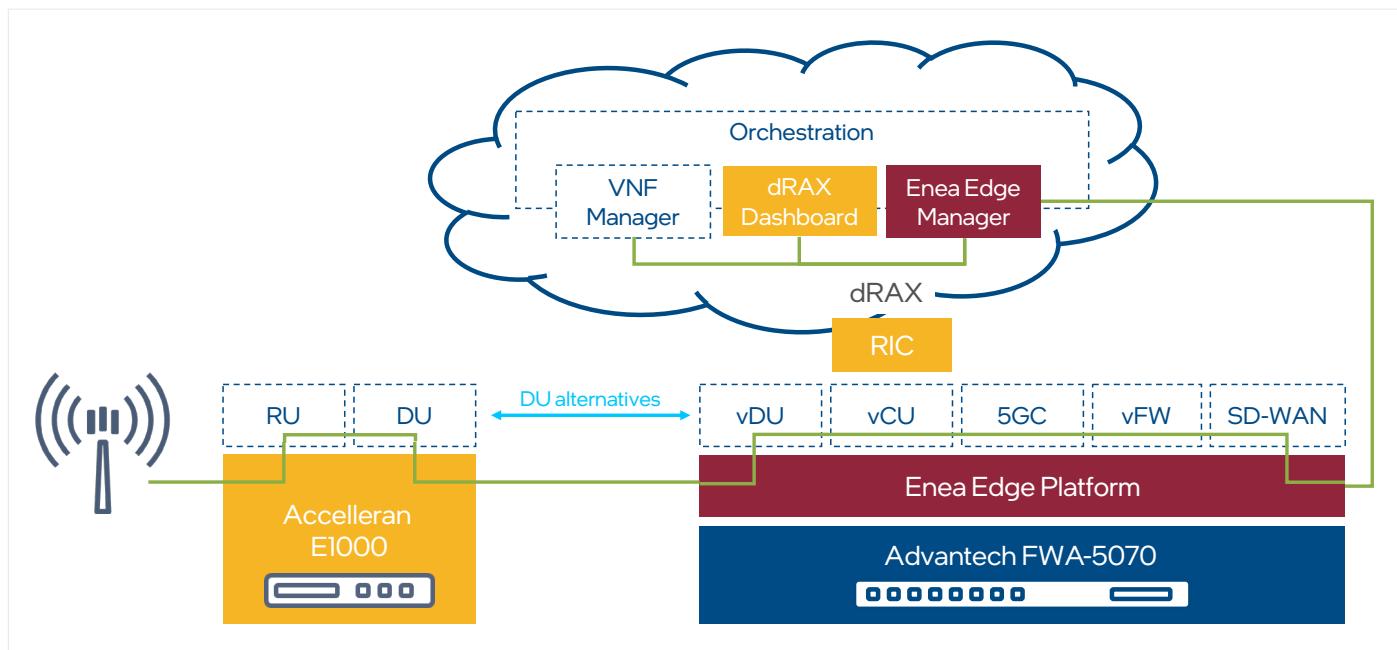


Figure 1. Complete private 5G solution.

Accelleran dRAX Provides 5G RAN

The Accelleran dRAX™ Single Carrier Local Area E1000 Series is the RAN Intelligence virtual RAN platform selected for the private 5G uCPE. The dRAX delivers a true multi-vendor, disaggregated and virtualized RAN intelligent control plane based on standards from the O-RAN Alliance (see Figure 2).

dRAX is cloud-native and is managed and orchestrated through Kubernetes (containers) or OpenStack (VMs). It supports key 5G features including control user plane separation (CUPS), user plane location independence, 4G and 5G compatibility and open interfaces for integration with third-party DUs/RUs enabling scalability and interoperability with carrier grade and mission critical software quality.

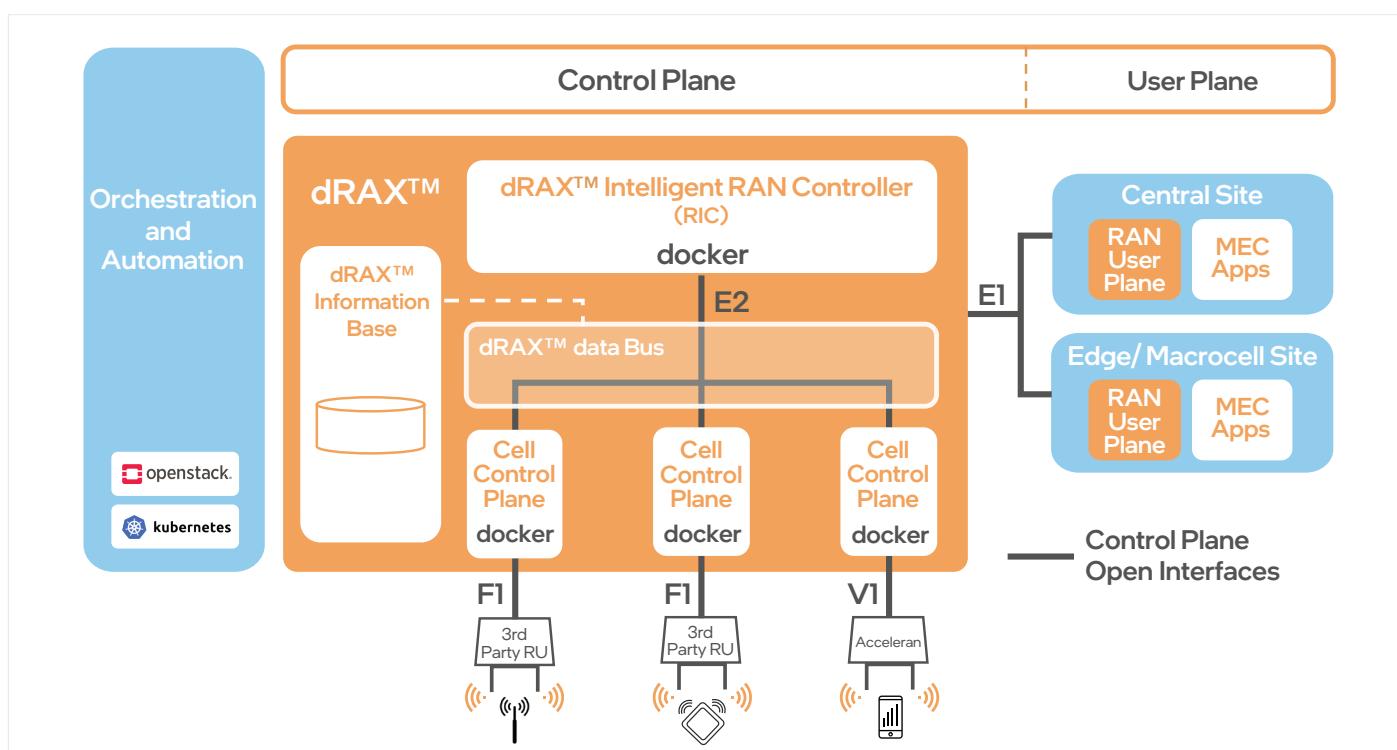


Figure 2. Accelleran dRAX block diagram.

dRAX software components cover the key control and resource management functions of the RAN including service orchestration, RIC, and the CU control and user planes (CU-CP, CU-UP). dRAX is pre-integrated with a range of DU and RU solutions from Accelleran partners and other vendors in the RAN ecosystem.

dRAX software can support all deployment scenarios from small-scale office networks with a handful of cells to large-scale solutions with multi-node clustering, load balancing, geo-redundancy and edge services.

Processing Performance from Advantech FWA-5070

The hardware for the private 5G uCPE is the 1U-high Advantech FWA-5070 rackmount network appliance (see Figure 3). The FWA-5070 is a powerful, Intel® Xeon® Scalable processor-based white-box platform with up to 28 cores. Because the virtualization

and private 5G software require only eight cores, there is additional compute power for other services to be delivered on the network appliance.

The single-processor white-box appliance can be configured with a variety of Intel Xeon Scalable processors based on processing needs. The server family includes 12 DDR4 2133/2400/2666 ECC registered memory slots with a capacity of up to 384 GB. There are four network mezzanine card (NMC) slots for a wide range of Gigabit Ethernet, 10 GbE, 40 GbE or 100 GbE network controllers. The network appliance includes one internal 8x or 16x PCIe slot to support full height / full length add-on cards, in addition to two internal 2.5" SATA HDDs/SSDs and one M.2 2280 SSD.

The FWA-5070 includes built-in Intel® QuickAssist Technology (Intel® QAT) support for added performance with encryption and compression and Intelligent Platform Management Interface (IPMI 2.0) and Redfish-compliant remote management.



Figure 3. Advantech FWA-5070.

uCPE Powered by Intel® Xeon® Scalable Processors

The edge network servers for the solution are based on Intel® Xeon® Scalable processors. Intel Xeon Scalable processors are the foundation for powerful edge platforms that deliver compute agility and scalability. Disruptive by design, they benefit from decades of innovation for the most in-demand workload requirements and are part of a complete set of network technology from Intel.

Intel Xeon Scalable processors enhance edge server solutions with a balanced architecture that supports AI with built-in acceleration and hardware-based security features. These CPUs are also engineered for modern 5G network workloads, targeting low latency, high throughput, deterministic performance, and high performance per watt.¹



Enea Edge is uCPE Foundation

Enea Edge is a complete virtualization environment and automated management platform for uCPE applications. Enea Edge is optimized to provide high performance with a small footprint. In addition to 5G RAN, it supports a full range of branch office use cases. Enea Edge components include:

Enea Edge Runtime is the uCPE virtualization and operating system. Enea Edge utilizes NETCONF for virtualized network configuration to minimize processing overhead. Out of the box, Enea Edge Runtime utilizes Linux kernel-based virtual machine (KVM) for virtualization and Docker for container virtualization. Virtual machines and containers can be set up in any combination. The applications communicate over an internal OVS bridge independently of virtualization implementation. Enea Edge Runtime is highly economical in its use of resources.

Enea Edge Management runs in the cloud and is the heart of the system, providing complete management of the virtual network

function (VNF) app catalog, coordinating VNF onboarding and integrating with the customer's orchestration and carrier operations support system (OSS), including providing telemetry to the OSS. Enea Edge Management supports thousands of edge nodes running 5G, SD-WAN and any other workloads the enterprise needs to run at the edge. It accomplishes its orchestration/OSS integration through the use of representational state transfer (REST) northbound application programming interfaces (APIs). The solution offers a fast setup with zero-touch provisioning.

Enea Edge Automation automates VNF lifecycle management and platform configuration. It leverages the REST-based northbound API and NETCONF to fit neatly into environments that already use other automation platforms. Enea Edge Automation speeds time to deployment as well, which enables customers to meet changing market demands quickly.

Figure 4 shows the relationship of the components of Enea Edge.

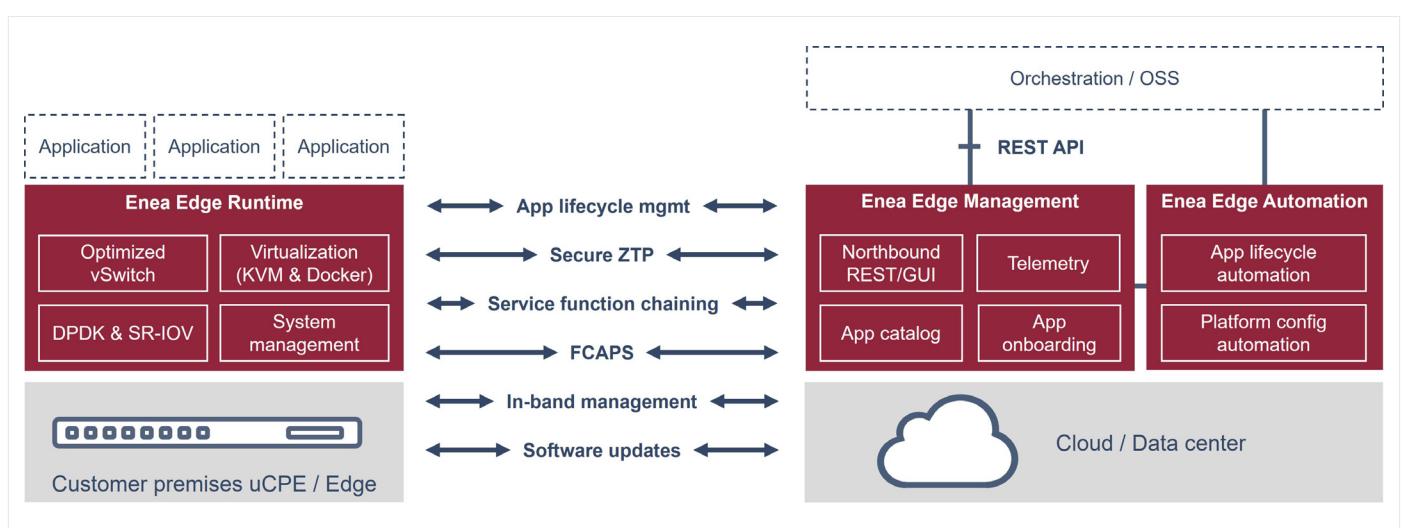
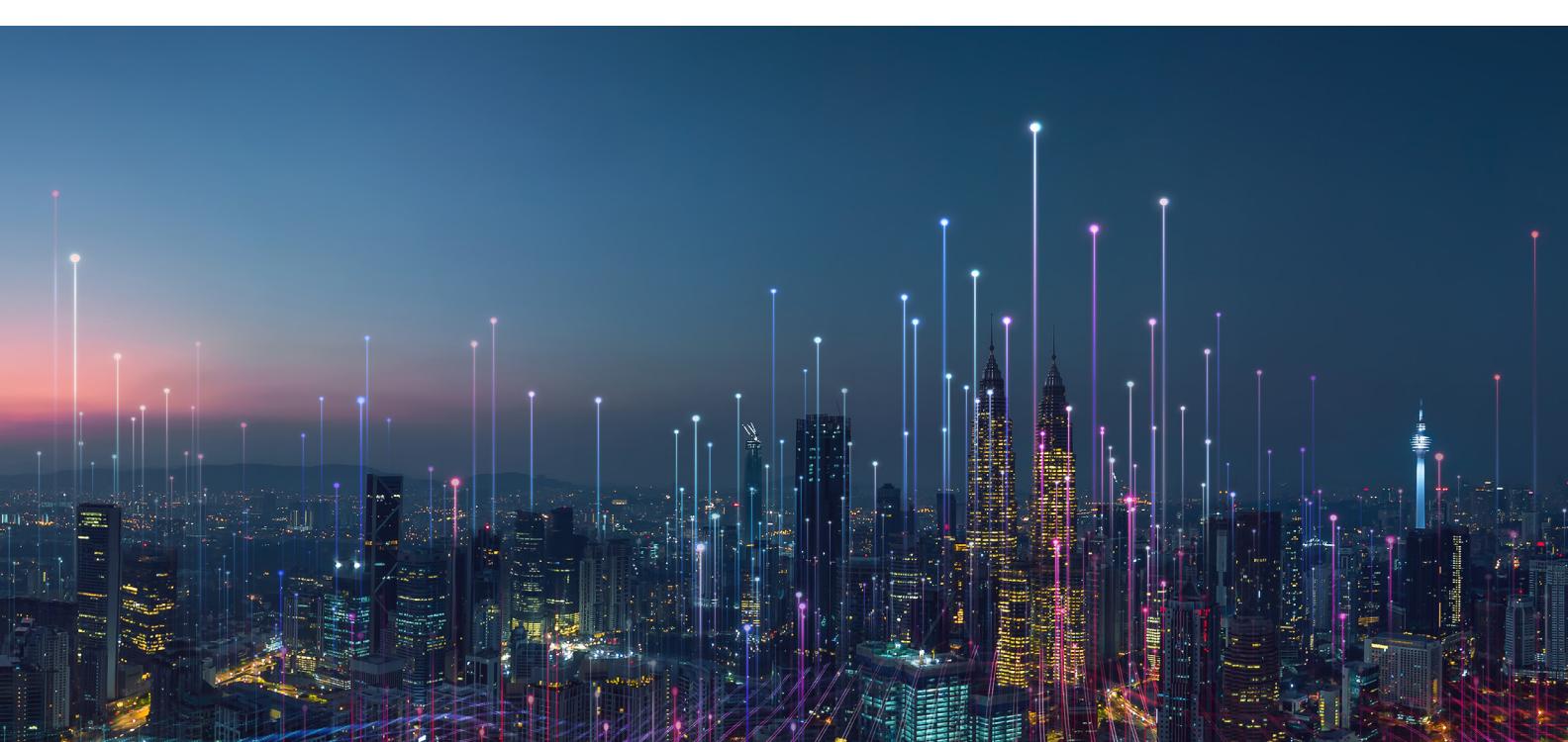


Figure 4. A schematic view of Enea Edge in a typical deployment.



Tier 1 CoSP Develops Private 5G solution

A Tier 1 CoSP that is a leader in the deployment of virtualized and open RAN systems is evaluating the Accelleran/ Advantech / Enea turnkey RAN solution for its new private 5G service. The CoSP is now trialing the turnkey solution for a network built with several on-premises systems connecting at the same time to a DU in order to provide better cost-effectiveness and easier management. The CoSP required the server to have enough processing power for the RAN functionality as well as the possibility to host software defined WAN (SD-WAN), security functionality or additional IoT applications.

Conclusion

Companies are embracing digital transformation of their operations and looking to 5G to provide the connectivity. Accelleran, Advantech, Enea and Intel have created a cost-effective turnkey RAN solution to serve the growing private 5G market. The combined solution provides CoSPs with the wireless performance and connectivity needed for successful enterprise IoT and digital transformation initiatives.

Learn More

[Advantech FWA 5070](#)

[Accelleran dRAX E1000](#)

[Enea Edge](#)

[Intel® Network Builders](#)

[Intel® Xeon® Scalable processors](#)



Notices & Disclaimers

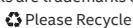
¹<https://www.intel.com/content/www/us/en/products/docs/processors/xeon/3rd-gen-xeon-scalable-processors-brief.html>

Intel technologies may require enabled hardware, software or service activation.

No product or component can be absolutely secure.

Your costs and results may vary.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.
1121/TM/H09/PDF



349176-001US