Red Hat

Open cloud RAN is now a reality

Learn how Intel, Altiostar, and Red Hat are driving open cloud RAN

Overview:

To benefit from using open RAN, the combination of hardware, platform, and RAN software must be aligned and tuned for the maximum reliability and performance.

Red Hat, Intel, and Altiostar bring a modern 4G and 5G RAN solution that combines Intel hardware accelerators optimized for the requirements of distributed units (DUs) and a Telco-proven, cloud-native platform with the unique capabilities brought by Kubernetes Operators, together with the O-RAN based containerized Altiostar vRAN offering.

With a modular and composable design following GitOps operational models for RAN with zero-touch provisioning of platform and workload on bare-metal deployments, which integrators can extend to build end-to-end solutions to meet the requirements of mobile operators.

Cloud-native open RAN opportunities

The adoption of open radio access networks (RAN)[1] disaggregated network architectures brings new benefits and challenges to communication service providers (CSPs) deploying these new models. Evolving from closed appliance RAN implementations, disaggregation helps operators move to a software-based solution that is more flexible and scalable. The disaggregated RAN decouples software from hardware components, and the deployments are broken down into functional elements: radio unit (RU), distributed unit (DU), and central unit (CU). Operators can locate functions independently, where needed, to adapt to the changing demands on their networks while optimizing the deployment and management costs.

Beyond 3GPP standard disaggregation, the open-RAN (O-RAN) Alliance promotes the cloudification of the RAN software, and with it, the adoption of containerized networking functions (CNF). Kubernetes is the preferred container orchestration platform for RAN workloads adopting this transformation.

As a result of these open RAN evolutions, a set of new open interfaces has emerged enabling interoperability across vendors, expanding the ecosystem of solutions an operator can provide, and increasing the speed to market of those new services.

With all these changes and the decoupling of the RAN software from the hardware, one of the benefits is that mobile operators can choose the best infrastructure, platform, and functional elements.
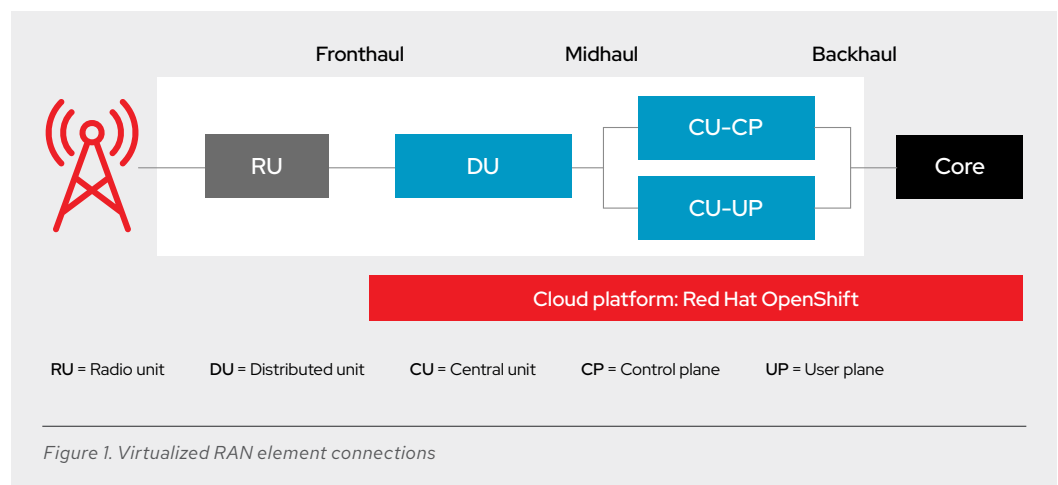

Figure 1. Virtualized RAN element connections

1 See *Open RAN and O-RAN in brief*

Cloud-native platform requirements for open RAN

The ability to choose the best cloud-native platform is part of the equation. The cloud-native container platform must be able to provide the features and capabilities required for the RAN workloads while maintaining the resiliency and performance expected from the mobile networks. Among the requirements imposed by open RAN deployments are:

▸ **Real-time kernel:** Stringent low-latency determinism for workloads requires Linux® kernel features such as interrupt handling and process scheduling in microseconds (μs) range.

▸ **Timing and synchronization:** Clock synchronization via transport networks is critical for radios using time division duplexing (TDD) to avoid interference, handling handover calls among cells and other frequency- and time-related activities. Precision time protocol (PTP) ITU-T support is among the key features that help provide this critical capability.

▸ **Hardware and network acceleration:** With forward error correction (FEC) functionality offloaded to off-the-shelf accelerators, field programmable gate arrays (FPGAs), SmartNICs, GPUs, and other hardware acceleration components are vital for open RAN infrastructure.

▸ **CPU isolation:** Capability to restrict workloads to specific CPUs is critical for workloads that require as much CPU time as possible or low-latency network applications such as DU and CU user plane (CU-UP).

▸ **NUMA awareness:** Resource, such as CPU, single root I/O virtualization (SR-IOV) virtual functions (VFs), and other device resources, for all quality of service (QoS) classes need alignment on the same non-uniform memory access (NUMA) node.

Red Hat for cloud-native open RAN

Cloud-native platform for RAN deployments at scale

Red Hat® OpenShift® Container Platform has been integrated and optimized for core and RAN workloads. Enhanced by Kubernetes Operators, the platform offers native support for:

▸ Real-time kernel with Red Hat Enterprise Linux CoreOS

▸ Fault, configuration, accounting, performance, and security (FCAPS)

▸ Certified operators to deliver:

▸ PTP time sync	▸ CPU isolation	▸ NUMA awareness
▸ SR-IOV management	▸ Nodes life-cycle management	▸ FEC and FPGA accelerators
▸ Operating system (OS) management	▸ Cloud-native virtualization/ OpenShift Virtualization (KubeVirt)	▸ Logging, metrics, and alarms

To address the scale of real RAN deployments, the cloud platform expands toward multicluster deployments across the access networks. This approach provides flexibility, supports automation, and can be centrally managed from the datacenter. Service providers are successfully using these capabilities in testing and field trials. The first test lab and field trial deployments are successfully validating flexible deployment models as well as distributed clusters.

Red Hat Advanced Cluster Management for Kubernetes is a centralized management and operation solution that provides:

▶ Zero-touch provisioning of OpenShift clusters for cloud, virtualization, and bare-metal deployments from single-node deployments to multinode clusters.

▶ Multicluster management and operations for OpenShift across clouds and on-premise virtualized and bare-metal clusters.

▶ Governance across multicluster deployments of features, capabilities, and applications.

▶ GitOps channels for modern operational models.

Automation and operations with GitOps for RAN

GitOps is an operational model where the source of truth for the infrastructure, platform, and workloads is a git repository that tracks all changes made to configurations, building a history over time. From there, tools supporting GitOps can deploy, operate, and manage clusters, operators, and workloads creating a modern operational model for RAN deployments at scale.

OpenShift Container Platform provides native GitOps capabilities with OpenShift GitOps Operator (ArgoCD), OpenShift pipelines (Tekton), and OpenShift serverless (Knative).

Figure 2. OpenShift deployments using Red Hat Advanced Cluster Management through GitOps
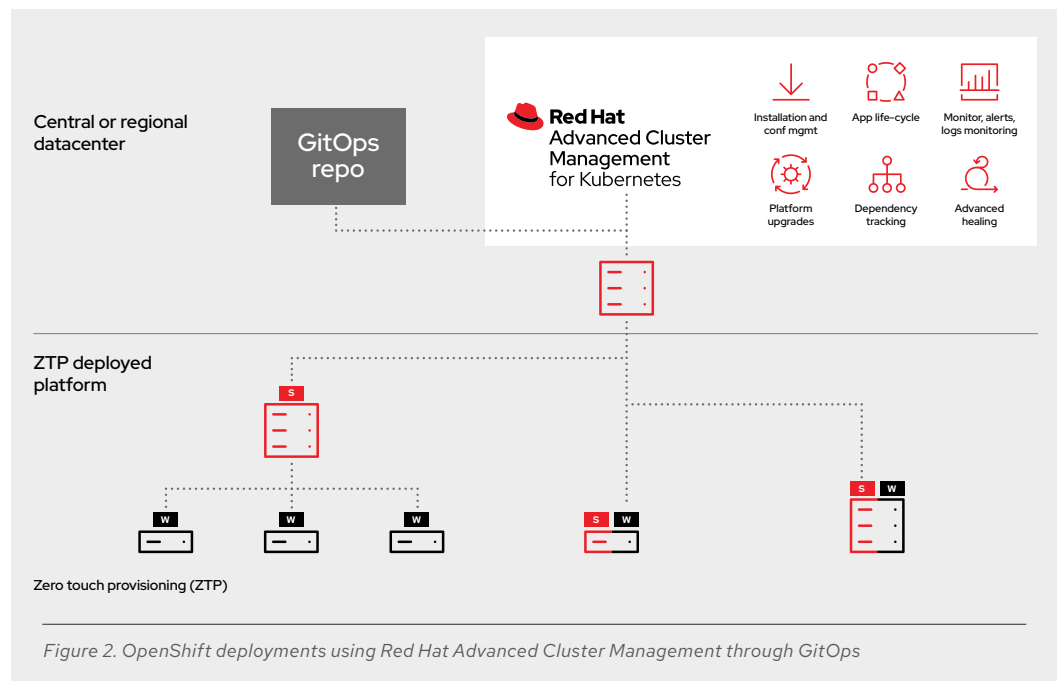
Thriving partner ecosystem

Open RAN accelerates and harnesses the power of innovation thanks to a deep collaboration among different partners. Red Hat's partner ecosystem uses and enhances our products to provide hardware, operators, and application services necessary for an end-to-end open RAN solution. Our partners have always been multipliers of the open source community and help drive joint customer success. They are uniquely positioned to support CSP RAN deployments in new and impactful ways—now and into the future.

Here are some notable partners who provide critical pieces to the overall effort:

Intel provides next-generation Xeon class processors, hardware accelerators, network adapters, and Certified OpenShift Operators to use vRAN hardware accelerators in OpenShift Container Platform.

‣ Third-generation Intel® Xeon Scalable Processors provide between 20-36 cores and power configurations for demanding environments.

‣ Intel FPGA PAC N3000 and the Intel vRAN Dedicated Accelerator ACC100 provide accelerated L1 forward error correction offload from using cycles on the CPU.

‣ Intel Ethernet 800 series adapters accelerate vRAN with packet-class sorting optimizations with near line-rate performance.

‣ Certified OpenShift Operators:

  ‣ OpenNESS Operator for Wireless FEC Accelerators provides single root IO virtualization (SR-IOV) forward error correction (FEC) programming on either Intel FPGA PAC N3000 or Intel vRAN Dedicated Accelerator ACC100 devices. These are virtual function (VF) devices that are used by key RAN workloads running on OpenShift Container Platform.

  ‣ OpenNESS Operator for Intel FPGA PAC N3000 provides the ability to flash the PAC N3000 with a user programmable image and update the onboard NIC card firmware.

Altiostar provides 4G and 5G open virtualized RAN (open vRAN) software that supports open interfaces and virtualizes the radio access baseband functions to build a disaggregated multivendor, web-scale, cloud-based mobile network. The open vRAN software provides:

‣ Common virtualized software for small-cell- and macro-cell-based 4G and 5G networks.

‣ Software programmability of bearer channels per use case, as required to create network slices.

‣ Automation of various operational tasks, such as new cell site integration (auto commissioning) and detection and automated recovery from failures (self-healing), further reducing operations expense.

Additionally, NEC, Tech Mahindra, and IBM are some of our ecosystem partners who provide network orchestration and management software solutions to use with open RAN deployments. .

Learn more

To learn more about the Red Hat product portfolio supporting open RAN deployments, visit Red Hat Advanced Cluster Management for Kubernetes, Red Hat OpenShift for GitOps, the Red Hat OpenShift Container Platform, and the Secure your path to 5G webinar.

About Red Hat

Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers integrate new and existing IT applications, develop cloud-native applications, standardize on our industry-leading operating system, and automate, secure, and manage complex environments. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. As a strategic partner to cloud providers, system integrators, application vendors, customers, and open source communities, Red Hat can help organizations prepare for the digital future.

facebook.com/redhatinc
@RedHat
linkedin.com/company/red-hat

North America	Europe, Middle East, and Africa	Asia Pacific	Latin America
1 888 REDHAT1	00800 7334 2835	+65 6490 4200	+54 11 4329 7300
www.redhat.com	europe@redhat.com	apac@redhat.com	info-latam@redhat.com

redhat.com
#F29179_0721