Red Hat | MAVENIR

Mavenir open RAN and Red Hat telco cloud

Highlights

- Single solution, single SLA

- Joint reference architecture

- Continuous validation, testing, and life cycle management

- Increased scalability, agility, security, performance, and ROI

- Extended options for tested and validated hardware

- Cloud economics from a single, horizontal platform

Introduction

This paper outlines the requirements for telco cloud for open RAN (radio access network) and how Mavenir and Red Hat have worked together to bring a joint architecture to the marketplace. Deploying and managing a comprehensive solution can be daunting but is significantly more feasible with the right tools and expertise. That is why having a complete solution that can provide a single service level agreement (SLA) is crucial. Additionally, continuous validation, testing, and life cycle management ensure that customers' systems are always up-to-date and optimal. With these measures in place, customers can enjoy increased scalability, agility, security, performance, and return on investment (ROI), all while enjoying peace of mind.
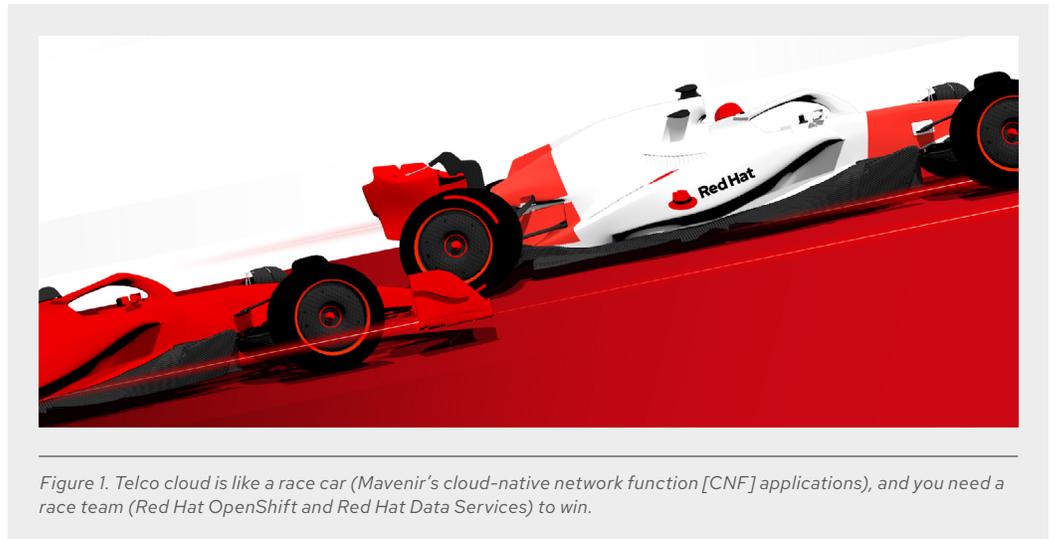

Figure 1. Telco cloud is like a race car (Mavenir's cloud-native network function [CNF] applications), and you need a race team (Red Hat OpenShift and Red Hat Data Services) to win.

The more than decade-long collaboration between Red Hat and Mavenir has led to a jointly created, unique architecture for Open RAN, based on Mavenir's containerized RAN solutions and Red Hat® OpenShift®. Our customers can now select a preintegrated solution that allows Mavenir to take full control over the end-to-end solution for maintenance, support, and SLA, or a modular predefined reference architecture that allows operators to choose superior components—all deployed on a common software infrastructure and integrated by either the communications service provider or a third party. Both options provide great benefits, and our years of experience ensure we can deliver reliable, high-quality solutions.

Defining telco cloud for open RAN

Telco cloud is a software-defined infrastructure characterized by its resiliency, high data processing capabilities, and low-latency network. Specifically designed for communications service providers (CSPs), it facilitates quick deployment of new services, prompt responsiveness to fluctuations in

network demand, and efficient management of both centralized and edge resources. It is one of the key foundational components in a successful network transformation. As telco network functions (NFs) evolve to service-based architectures (SBAs), they overcome certain limitations of virtual machines and provide more straightforward implementation and overall management. One of the defining characteristics of a telco cloud is its ability to provide an end user with a carrier-grade[1] level of availability and quality of experience (QoE). As RANs evolve to cloud-native, service-based architecture, the need for carrier-grade cloud platforms is becoming increasingly crucial. These platforms—built on containers—are considered key drivers for this evolution, due to their potential to reduce costs and enhance operational efficiency.

Business drivers for open RAN

Service providers are becoming increasingly interested in the benefits of an Open RAN. This is evident from the increased participation in alliances and groups such as the O-RAN Alliance (O-RAN), Telecom Infra Project (TIP), O-RAN Software Community (SC), the Small Cell Forum (SCF), and open RAN Policy Coalition. Open RAN refers to a general concept of designing and implementing RAN solutions with open and interoperable interfaces, standards, and protocols. The goal of Open RAN is to encourage a diverse ecosystem of vendors and foster competition and innovation. It aims to prevent vendor lock-in, which has traditionally been a significant issue in the telecommunications industry, by allowing network operators to mix and match components from different suppliers.

There are several benefits of using an open RAN solution versus a traditional RAN, including:

▸ Increased flexibility, scalability, and optimization of resources. With the latest innovations and choices from the broader hardware and software vendors' ecosystem, service providers can lower costs because a common infrastructure spans the entire network beyond the RAN.

▸ A potential reduction in capital and operational expenditures using commercial, off-the-shelf hardware.

▸ Improved performance using modern hardware and software platforms that scale out on demand.

▸ Deployment flexibility. With the disaggregation of software from the underlying hardware, service providers gain flexibility as network functions allow for the most optimal locations.

▸ Increased efficiency, performance, resiliency, security, and agility. Service providers can boost innovation and create differentiation using virtualization technologies, such as network function virtualization (NFV) and containers.

▸ Simplified and automated infrastructure and workload life cycle and operations management for a consistent approach to the deployment and operations of vRAN and O-RAN architectures.

Technical consideration when designing, deploying, and operating an open RAN

Service providers need their cloud platform to deliver the features and capabilities for their open RAN, along with the necessary resiliency and performance they expect.

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1 *redhat.com. "What does 'carrier-grade' mean?," 9 Jan. 2023.*

Open RAN architectures impose several requirements, including:

▸ **Real-time kernel.** Workloads have stringent low-latency determinism requirements for core kernel features, such as interrupt handling and process scheduling, in the microsecond (**μ**s) range.

▸ Timing and synchronization. Time synchronization via transport networks will be critical for 5G radios. Precision Time Protocol (PTP) remains the preferred method to deliver timing across packet-switched networks.
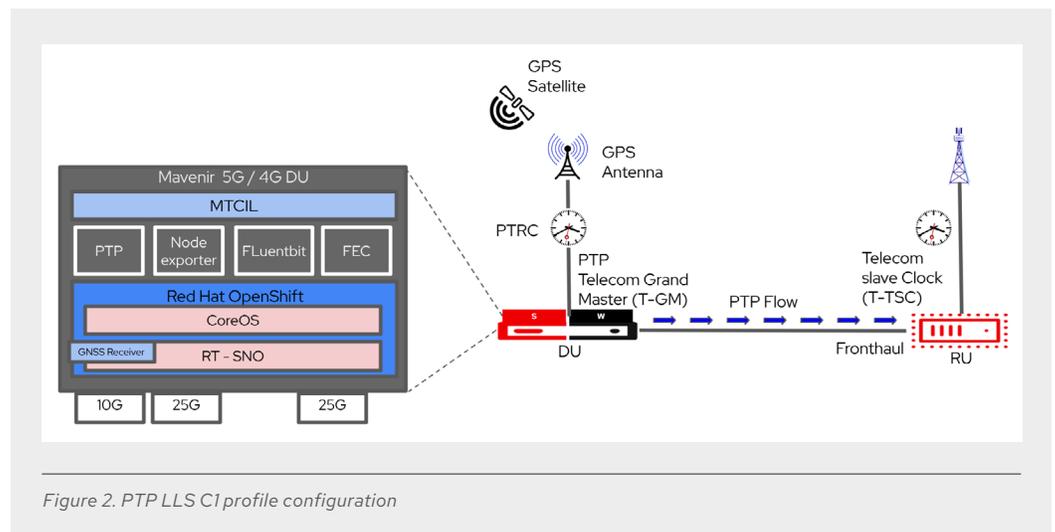

Figure 2. PTP LLS C1 profile configuration

▸ Hardware acceleration. Field Programmable Gate Arrays (FPGA), smart network interface cards (SmartNIC), and other hardware acceleration components will be vital for 5G virtualized infrastructure.

▸ Central processing unit (CPU) management. This is the management of groups of CPUs to constrain workloads to specific CPUs. It is useful for workloads that require as much CPU time as possible or are low-latency network applications.

▸ Topology management. This collects hints from CPU management and other platform hint providers to align pod resources, such as CPU, single root input/output virtualization (SR-IOV) virtual functions (VFs), and other device resources, for all Quality of service (QoS) classes on the same nonuniform memory access (NUMA) node.

▸ Low latency. A combination of multiple factors allows the workload the maximum processing capacity and minimizes packet delivery latencies.

▸ Zero touch provisioning. This provides all of the tools required to install, upgrade, and maintain the cloud infrastructure for the RAN workload with minimum user interaction in an appliance—like deployment, with reduced complexity and increased flexibility of options and performance.

▸ Remote management. Take full control of edge and RAN operation from a centralized, single pane of glass using Red Hat Advanced Cluster Management for Kubernetes. This includes installation and upgrade, application provisioning, and monitoring.

▸ Reduced footprint. Remote radio sites have limited space and power; therefore, edge and RAN clouds would require a small cloud footprint.

▸ System integration. Components do not work together automatically and require system integration by either the open RAN vendor, the CSP, or a third-party system integrator responsible for ensuring end-to-end solution deployment, maintenance, support, and SLA.

Joint value offered by Red Hat and Mavenir for open RAN

▸ Joint reference architecture eases deployment and provides peace of mind. Red Hat connects service providers' business needs with open source technologies through our open approach and ecosystem. Red Hat has fostered a strong collaboration with partners like Mavenir and is focused on innovation for the RAN. We continuously validate Mavenir's network functions to ensure they work reliably with our products, giving service providers more confidence and removing risk from deploying and operating a RAN. Red Hat has invested in more than 250 engineers dedicated to solutions for RAN. We have jointly developed blueprints and reference architectures with Mavenir to allow service providers to deploy preintegrated RAN components.

▸ Red Hat provides a complete application platform for service providers and has partnered with Mavenir to form a complete solution with the flexibility to provide a single SLA. Our extensive portfolio provides a common, consistent cloud-native platform, combining with Mavenir's necessary functional components, orchestration, and integration services for full operational readiness.

▸ Benefit from continuous validation, testing, and life cycle management. Mavenir and Red Hat jointly developed a test environment for Mavenir's CNFs. This allows both organizations to collaborate on development, testing, and deployment for accelerated adoption and bring a proven blueprint to the market.

▸ Increase scalability, agility, security, performance, and ROI. This partnership allows Mavenir to fully focus on its core expertise, such as its network functions, services, and own integrations while Red Hat focuses on the development, integration, and operation within a cloud environment. This complementary expertise and collaboration on a modular predefined reference increases the effectiveness and efficiency and minimizes complexity for our customers. As a result, customers can focus their resources more on rolling out their telco cloud services.

▸ Our partnership allows customers to work with extended options of tested and validated hardware. These options conform to telco requirements that include small server sizes that can fit in cell sites and run Mavenir RAN CNFs.
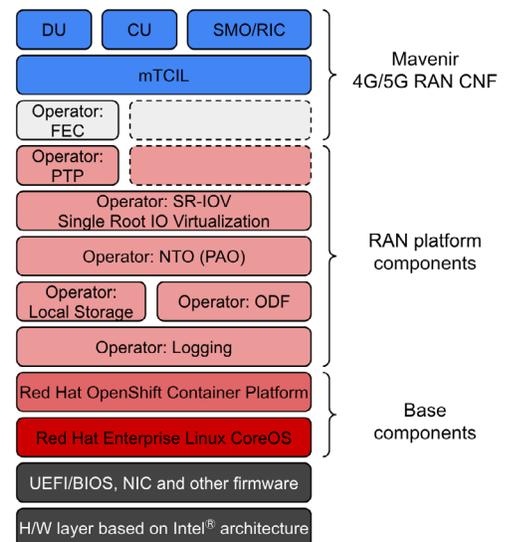
Our joint solution allows service providers to take advantage of the benefit of cloud economics from a single, horizontal platform. Red Hat OpenShift delivers low and predictable latency, high bandwidth, and distributed architectures that open RAN architectures need. A container-based platform offers a more security-focused, simple, scalable, and flexible way to evolve a RAN. The infrastructure also has resilient options: compact, multinode clusters, single-node, and remote workers.
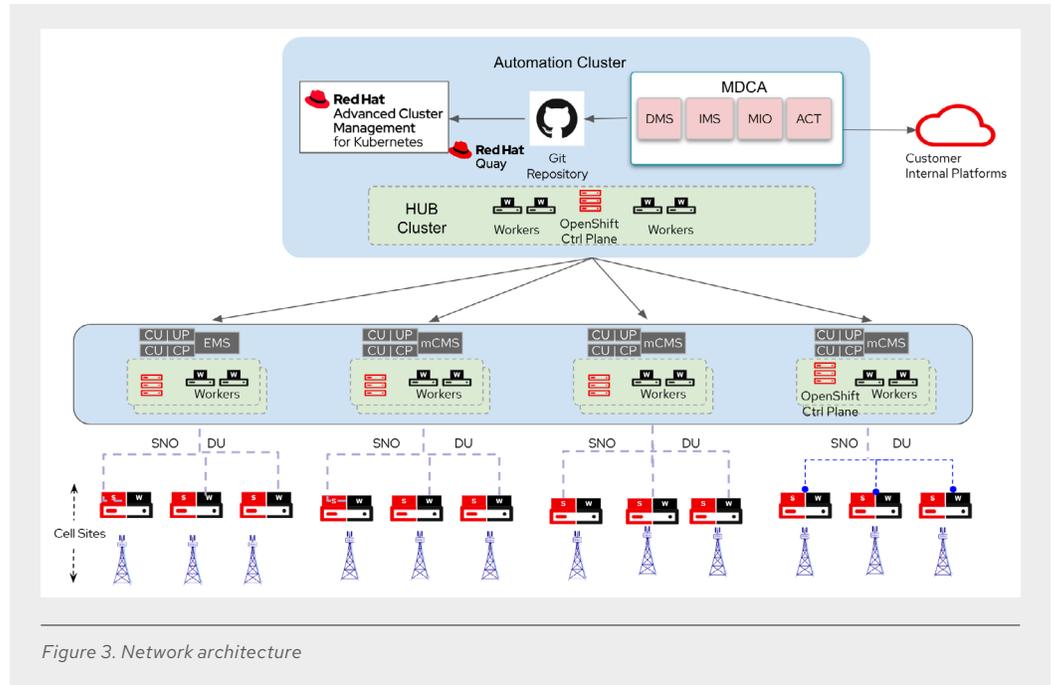

Figure 3. Network architecture

Higher resource utilization is achieved by supporting multiple, scalable network functions across different locations. Red Hat Advanced Cluster Management and a GitOps methodology facilitate deploying resilient, manageable, and observable open RAN architectures.

The right container platform can increase the speed of deployment. Red Hat Ansible® Automation Platform and a GitOps methodology that uses infrastructure as code (IaC) accelerates RAN service delivery, mitigates risk through consistent and compliant configuration management, and offers increased automation for greater control over costs.

Together, Red Hat and Mavenir are committed to solving the challenge of open RAN and the next generation of 5G and providing the solution as a full stack.

As a newly emerging technology standard, open RAN solutions often lack key building blocks and cannot be deployed immediately. Mavenir RAN preintegrated with Red Hat OpenShift brings a full stack solution to operationalize RAN.

With cloud infrastructure, a cloud infrastructure platform, and open RAN software as part of a fully integrated stack that includes life cycle management, orchestration, and automation, CSPs and enterprises making the shift to 5G can benefit from 2 solutions that complement each other's value and create new competencies when operated together.

For more information, read the overview, "Implement open RAN with Mavenir and Red Hat."

About Mavenir

Mavenir is focused on transforming the way the world connects.

Mavenir is building the future of networks and pioneering advanced technology, focusing on the vision of a single, software-based automated network that runs on any cloud. As the industry's only end-to-end, cloud-native network software provider, Mavenir is focused on transforming the way the world connects, accelerating software network transformation for 300+ Communications Service Providers and Enterprises in over 120 countries, which serve more than 50% of the world's subscribers.

About Red Hat

Red Hat helps customers standardize across environments, develop cloud-native applications, and integrate, automate, secure, and manage complex environments with award-winning support, training, and consulting services.

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