White Paper

Communications Service Providers
Virtualized Radio Access Networks

intel.

Accelerating 4G/5G Open RAN Deployment with netOps.ai

Tech Mahindra establishes demonstration pod with Intel and Altiostar showcasing zero-touch virtual network function onboarding

Mobile network operators (MNOs) are challenged to expand capacity to accommodate booming mobile data traffic as well as invest in 5G networks to support next-generation services. The challenge is to accomplish this in an environment where growth in new mobile subscriptions is slowing.

These business conditions have MNOs increasingly turning to more agile and lower-cost virtualized network technologies. Open virtualized radio access networks (vRAN) are a target for these MNOs because vRAN can make a big impact on the overall cost of a network. According to industry estimates,[1] some 65%-70% of the total cost of ownership of a network is in the RAN.

The air interface part of RAN requires real-time digital processing of radio signals. This real-time processing requirement had previously limited the virtualization of RAN software components. But now, a number of companies have created vRAN products that overcome this real-time processing challenge and allow for hardware-software disaggregated deployment of vRAN software on commercial off-the-shelf (COTS) hardware. Some major MNOs have also adopted the technology and are already offering vRAN-based 4G services. This is expected to grow for 4G network expansions and new 5G networks.

Along with the disaggregation, the O-RAN Alliance has been established to develop open source versions of various vRAN protocols and functions. The O-RAN Alliance is dedicated to ensuring open interfaces between different components of the RAN and will eliminate the need for proprietary systems that are not interoperable. In addition to open interoperability, the O-RAN Alliance is working to bring more intelligence to the RAN, which will help with managing the complexity of 5G networks.

vRAN Complexity

5G has demanding service and network requirements that require a fundamental change to the RAN and infrastructure architecture compared to 4G. In addition, 5G networks also bring more densification, higher data speeds, and more complex application requirements. These requirements make the overall deployment process highly complicated and difficult to manage manually. In addition, the virtual network functions (VNFs) and containerized network functions (CNFs) that deliver the services are not standardized, which in turn raises the potential for deployment testing and interoperability issues.

The deployment challenges slow down integration and onboarding of a new service considerably and contribute to lower customer satisfaction and longer time to revenue. In an effort to speed up the rollout of vRAN and 5G, Intel® Network Builders ecosystem partner Tech Mahindra (Tech-M) is offering netOps.ai, an automation and managed services framework designed to accelerate the service lifecycle stages for vRAN applications. Intel, Tech-M, and Open vRAN software provider Altiostar have recently collaborated on a demonstration that shows how netOps.ai streamlines deployment testing and fully automates VNF deployment.

netOps.ai Automation Framework

netOps.ai is a next-generation automation framework designed for rapid deployment of greenfield 5G networks along with 5G migrations of brownfield 4G networks. The framework is based on continuous integration/continuous deployment (CI/CD) techniques that enable rapid response to incidents and problems either automatically using autopilot mode or manually with defined standard operating procedures or workflows.

As seen in Figure 1, there are five netOps.ai modules:

- Continuous Change (CI/CD)
- Continuous Orchestration
- Continuous Test
- Continuous Assurance
- Continuous Intelligence (AI-based)

Bringing all the data from these modules together is the Operations Cockpit that manages and tracks all methods and procedures across infrastructure, access, core, and transport networks, which facilitates a hyper-automated network deployment across all these domains.

For networks in transition from legacy equipment to virtualized infrastructure, netOps.ai provides a common and unified cloud platform solution for both physical network functions (PNFs) and VNFs. This allows MNOs to easily move network and IT workloads into the cloud and to automate and orchestrate these functions from a single management console.

The netOps.ai framework is cloud native with a Kubernetes-orchestrated, microservices-based design that is scalable to manage life cycle management functions for hundreds of thousands of vRAN nodes throughout a network. netOps.ai can be run in the cloud or as a VNF on the server. It brings CI/CD tools to all of the other service-provisioning VNFs that are in the server.
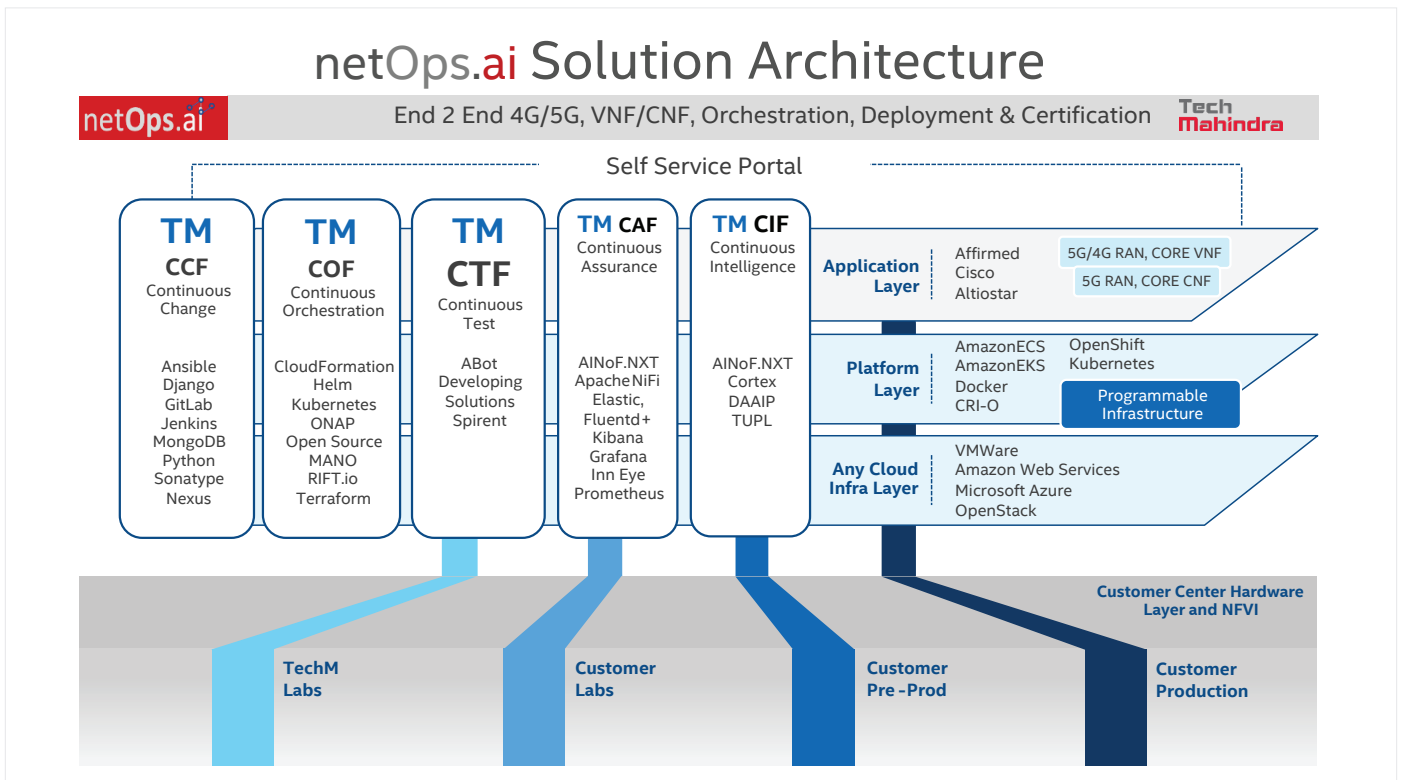

Figure 1. Block diagram of netOps.ai modules, partnerships, and inputs.

Transitioning from Legacy RAN to vRAN

MNOs are embracing vRAN solutions to expand their 4G/5G networks and look to Tech-M to ensure there is a seamless operation between the existing infrastructure and vRAN architectures. Moving to this model will require MNOs to combine IT and network competencies. This has remained a challenge in the early days of NFV and SDN, and it will be no different as service providers move to tackle vRAN.

With more than 30 years of extensive radio frequency (RF) experience and pioneering virtualized solutions with SDN/NFV for RAN and core, Tech-M's vRAN offerings include

the full spectrum of systems integration (SI) services from planning and design to testing and implementation to managed services, operations, and product engineering.

Beyond just connecting the S1 interface from the vRAN to the network core, Tech-M's experience with sizing the network and making it operational is vital to establishing the new service. As seen in Figure 2, Tech-M's system integration process spans the entire lifecycle of a service from the lab and field trials required to vet the new software all the way to ongoing product engineering services to manage upgrades and service lifecycle.
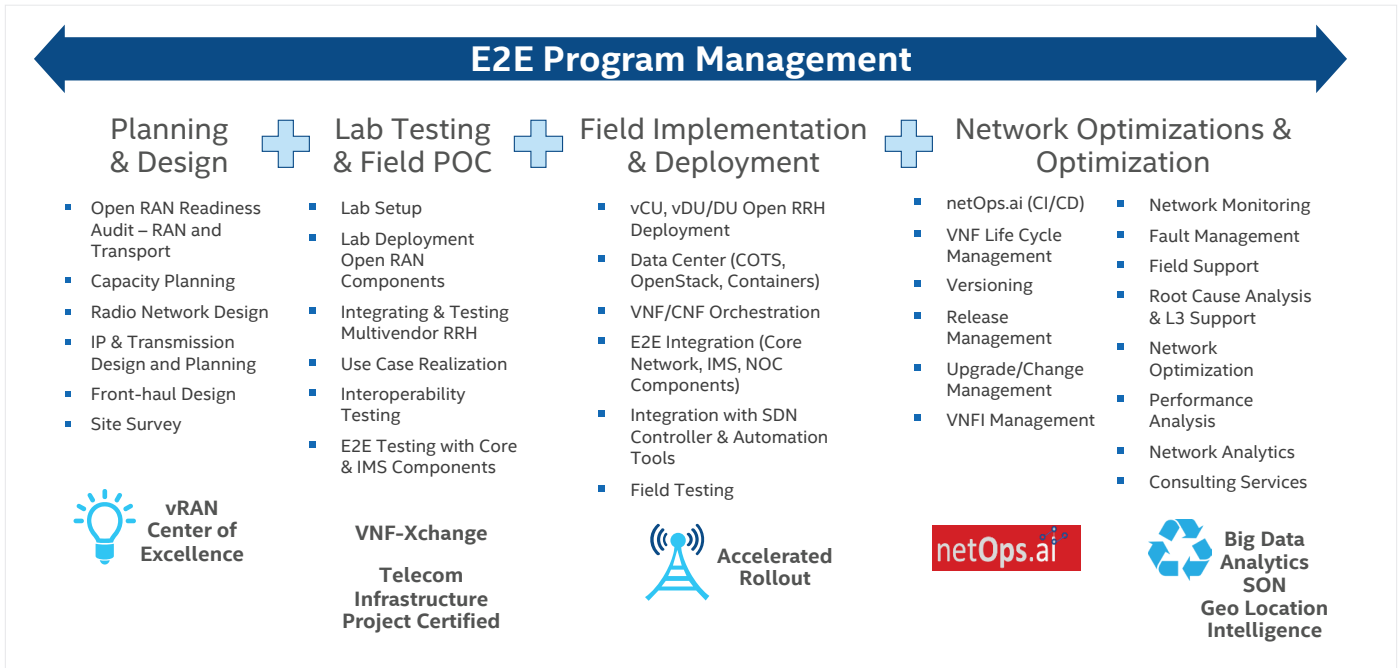
Figure 2. Tech-M system integration services.

netOps.ai Demonstration Pod

The vRAN is a part of the network that makes extensive use of the netOps.ai functionality. Virtualized RANs offer lower cost 5G network build-outs for MNOs as well as scalability that enables cost-effective 5G build-outs for all network sizes. Seamlessly transitioning from traditional RAN networks to a virtualized, cloud-based model, however, adds integration complexity both when the network is built and during operation.

Tech-M works with all leading vRAN vendors to provide joint customers a more customized solution. One example is the company's work with Altiostar, which is a participant in the netOps.ai demonstration pod. To demonstrate the complete solution from Tech-M and Altiostar, the company set up a demonstration system that entails a complete small cell base station that includes the equipment shown in Figure 3.

- Altiostar – Provided the complete virtualized distributed unit/central unit (vDU/vCU) Open vRAN software solution.
- QCT – Provided an Intel® Xeon® Scalable processor-based server to run the vCU software.
- Kontron – Provided an Intel® architecture-based server to run the vDU software.
- Sercomm – Provided the eNodeB small cells.
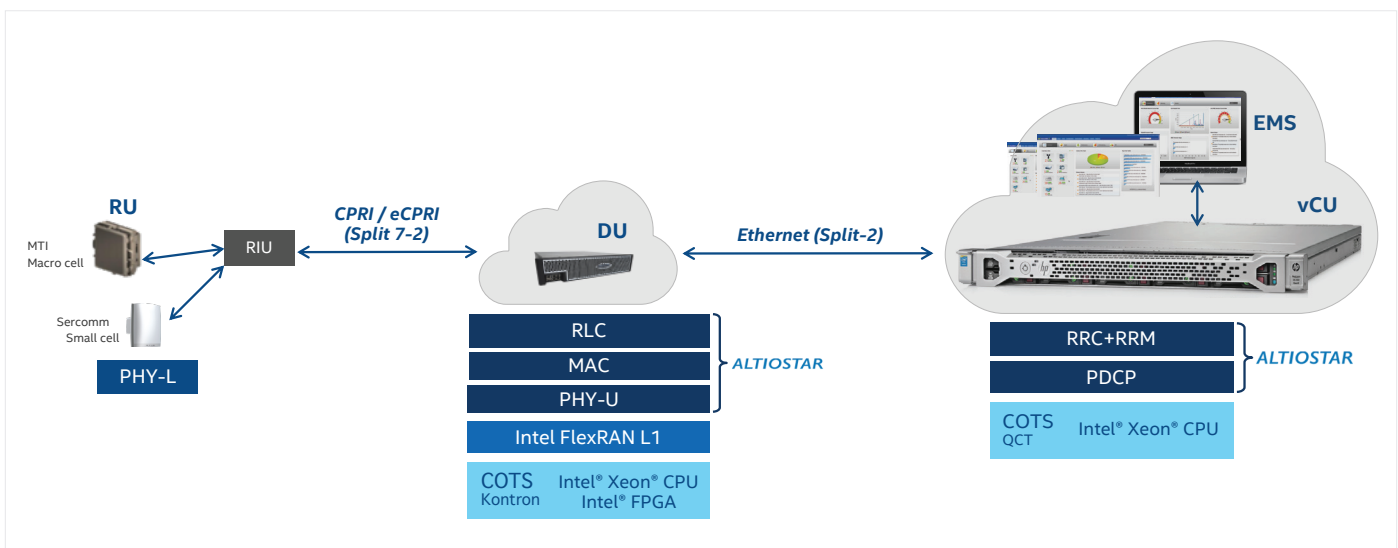- MTI – Provided the remote radio heads (RRH).

Figure 3. netOps.ai demonstration pod with Altiostar and Intel.

Tech-M uses the pod to demonstrate several key features of the netOps.ai solution, specifically the robot framework for network test automation. Because the network is changing frequently, it needs to be tested constantly. The robot framework automates and simplifies the testing and validation of the interoperability of the new VNF with the entire virtualization infrastructure and other VNFs operating on the server. The robot framework (seen in Figure 4)

manages the test scripting, test driver, the validation, and the reporting, taking inputs such as config files, device lists, and others. The framework is connected to the device under test (DUT) and to the testing tools and manages the entire process. A suite of reusable procedures is available for common functionality tests, for example, device attach/detach, browsing, throughput (iperf), statistics, and others.
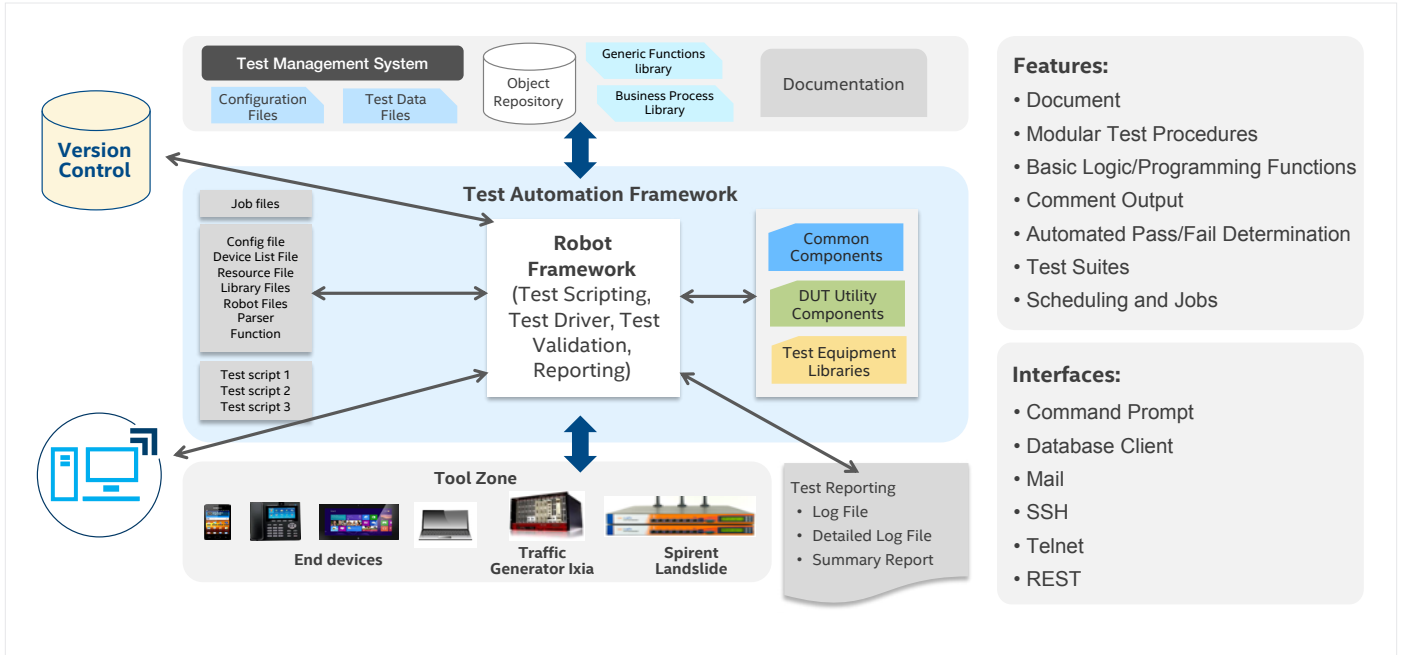

Figure 4. Block diagram of robot test automation framework.

To date, over 100 different test cases have been developed using multiple automated scripts. Test cases are designed and automated to deploy in multiple combinations.

The other key functionality demonstrated is the netOps.ai zero-touch VNF onboarding. As seen in Figure 5, VNF vendors provide their software in a standard format that includes the software image, the descriptor, and the configuration files. This information is fed into the netOps.ai DevOps pipeline that checks the capacity availability, configures the NFVI to accept the VNF, and actuates the instantiation, scaling, and termination processes—all without human intervention.

The demonstration pod is a valuable tool to show the benefits of the netOps.ai and how it can make automated deployment capabilities inherent in VNFs—especially for Open RAN implementations.

Conclusion

The use of a demonstration pod allows Tech Mahindra to show the zero-touch onboarding capability of netOps.ai Automation Framework in a real-world network utilizing Altiostar's Open vRAN software running on Intel architecture-based servers. Through this real-life demonstration, MNOs can see how netOps.ai provides a low total cost of ownership, significant reduction in time to market, and scalable operations.
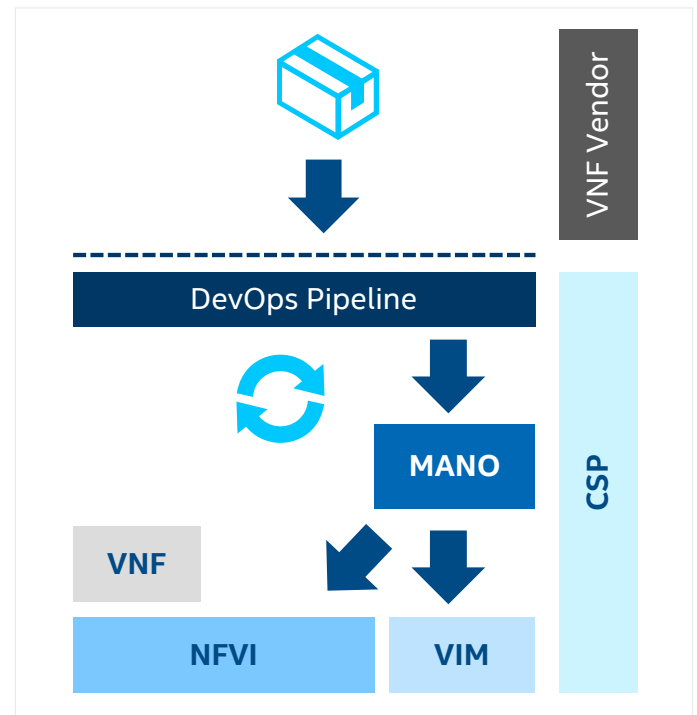

Figure 5. VNF zero-touch onboarding functionality.

For More Information

netOps.ai: https://www.techmahindra.com/en-in/techmahindra-launches-netops-ai-to-accelerate-5g-adoption-for-communication-service-providers/

Altiostar: https://www.altiostar.com

Intel Network Builders: https://networkbuilders.intel.com

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