VMware Telco Cloud Automation

Operational agility through unified orchestration and automation for the telco cloud

At a glance

VMware Telco Cloud Automation is a multidomain automation platform that accelerates time to market of communication services while igniting operational agility through unified automation across networks and clouds.

Communications service providers (CSPs) are transitioning from physical to cloud networks to gain operational agility, network resiliency and lower operating costs. This shift marks a radical departure from the traditional single-purpose hardware appliance model, especially as CSPs must now design and operate services across a web of data centers and clouds while enabling interoperability across competing software vendors.

Given the complexity of coordinating new cloud technologies and network functions and managing multiple services, CSPs want an automated approach that removes complexity and error-prone manual processes. To address these challenges and improve operational efficiency, CSPs are turning to VMware Telco Cloud Automation®.
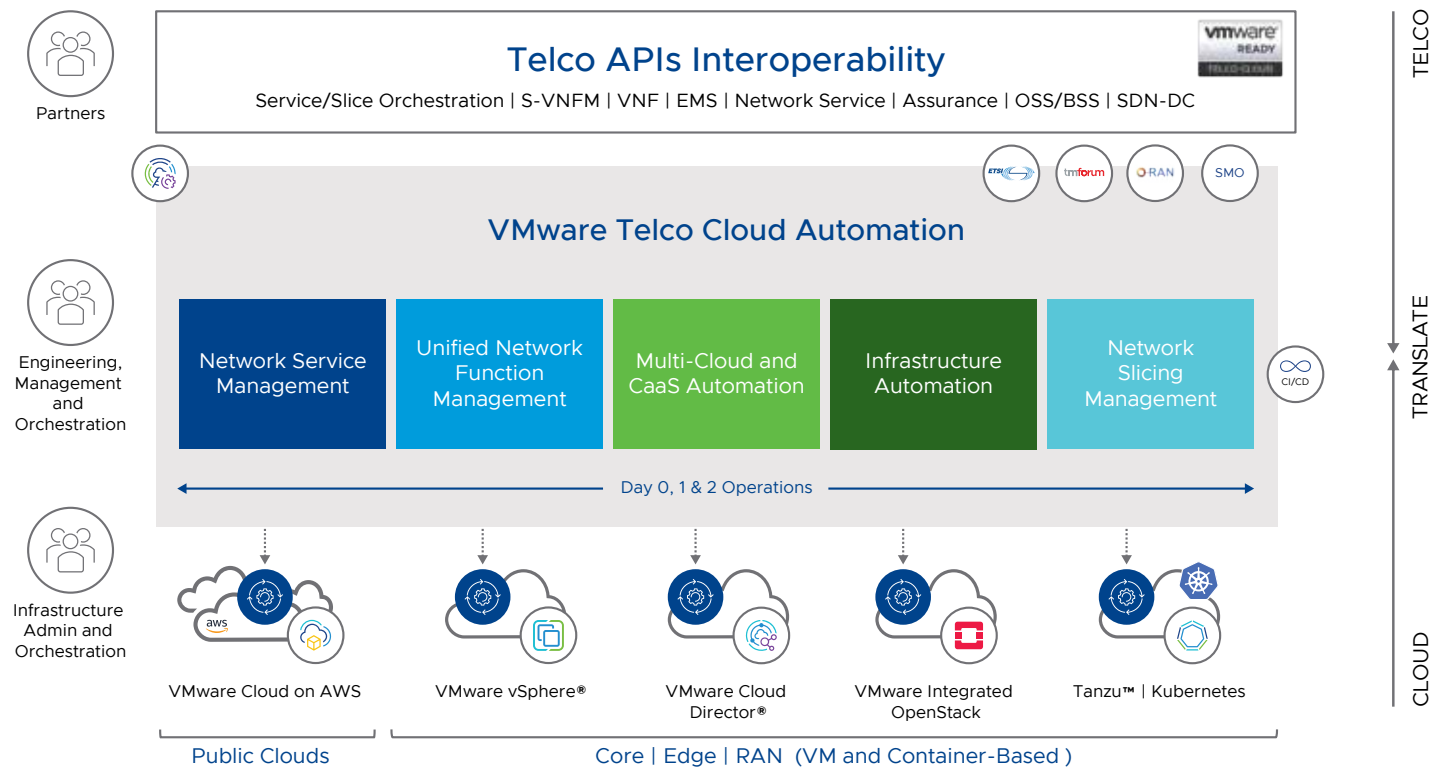

Figure 1: VMware Telco Cloud Automation

Key benefits

- Accelerate time-to-market of network functions and services.

- Integrate 5G network capabilities alongside existing architecture.

- Gain operational efficiencies and avoid error-prone manual tasks.

- Effectively support VNFs and CNFs through end-to-end lifecycle management.

- Enhance the service experience through workload mobility, dynamic scalability, closed-loop healing and improved resilience.

- Optimize cloud resource utilization through cloud-smart placement and automated Kubernetes and infrastructure customizations ("late-binding").

- Transform to cloud native with Kubernetes upstream compliancy, cloud-native patterns and container-as-a-service (CaaS) automation.

- Avoid costly integration fees, maximize current VMware investments, innovate faster, reduce project complexity and speed deployment with pre-built VMware integrations.

What is VMware Telco Cloud Automation?

VMware Telco Cloud Automation is a multidomain automation platform that accelerates time to market of communication services while igniting operational agility through unified automation across network domains and clouds. It offers consistent multi-cloud operations (Days 0, 1 and 2) for each layer of the telco cloud, from infrastructure to services and network slicing, and it streamlines the CSPs' orchestration journey with native integration to VMware Telco Cloud. VMware Telco Cloud Automation is grounded in compliance with standards and a broad ecosystem of certified partners, limiting implementation risks and enabling an open, best-of-breed modern network architecture.

VMware Telco Cloud Automation applies a cloud-smart approach to abstract the cloud evolution complexity and delivers network resources on-demand, thereby lowering operating expenses, optimizing infrastructure investments and bolstering the delivery of revenue-generating services.

What's more, when developing an effective automation and orchestration solution, it is essential to keep in mind that CSPs globally find themselves at different stages of network maturity. As such, VMware Telco Cloud Automation manages 4G, VNF-based networks; helps a CSP graduate to 5G, CNF-based networks; and—for those CSPs that already operate with 5G, cloud-native networks—supports cutting-edge automation, such as network slicing to unlock new revenue sources.

An effective automation solution must support both VNF- and CNF-based workloads and help carry a CSP from 4G to 5G in a way that minimizes network disruption and opens avenues to reduce costs and bolster revenues. In other words, the path to network modernization lies in constructing features that address tomorrow's requirements and can provide end-to-end management, automation and orchestration for many of today's 4G-based requirements as well. VMware Telco Cloud Automation provides extensive network automation for 4G and 5G-based networks.

vmware®

Key benefits (continued)

- Shortcut the time to provision new network sites or expand capacity to existing ones.

- Leverage best-of-breed network functions and benefit from a healthy and thriving multivendor ecosystem.

- Minimize version validation efforts.

- Create on-demand, isolated, end-to-end logical networks runnings on shared and common infrastructure with Network Slicing for VMware Telco Cloud Automation.

- Utilize a single pane of glass for centralized, multi-cloud CaaS management across both private and public clouds.

- Improve operational efficiency of Day 0–Day 2 processes to reduce operating expenses.

- Consolidate workloads onto fewer servers to reduce capital expenses and data center carbon footprints.

VMware Telco Cloud Automation's core management and automation modules

Centralized multidomain, multi-cloud network management with distributed control offers a single pane of glass and consistent experience to provision, monitor and manage telco cloud network functions virtualization (NFV) and cloud-native software for radio access network (RAN), edge and core domains over private and multi-cloud infrastructure. VMware Telco Cloud Automation also provides APIs to act as a single point of integration to CSPs' existing DevOps practices and continuous integration, continuous deployment (CI/CD) tools.

Telco Cloud Automation allows CSPs to leverage Amazon Web Services (AWS) public cloud resources with VMware Cloud on AWS and/or EKS. Telco Cloud Automation provisions cloud-native network functions directly on native Amazon Elastic Kubernetes Service (EKS), bringing unified management of workloads on-premises and on public cloud infrastructures. As such, Telco Cloud Automation offers multi-cloud consistency, easing workload onboarding, instantiation and lifecycle management while promoting mobility from the network core to edge to RAN, and from private to public clouds.

Cross-domain orchestration simplifies the design and management of single to multi-vendor network services in a centralized or distributed network architecture using NFV and cloud-native network functions.

Unified network function automation standardizes multivendor network functions onboarding, instantiation and lifecycle management over virtual machine (VM) and container-based infrastructure. Combining the network function layer with the underlying infrastructure management allows for better placement and resources allocation.

CaaS automation reduces the complexity to deploy and operate Kubernetes at scale in a distributed and multi-cloud network architecture. CaaS automation facilitates the registration of existing Kubernetes clusters or the provisioning of new ones and their lifecycle management, including post-deployment customization and Kubernetes version upgrades.

Importantly, Telco Cloud Automation CaaS management utilizes a cutting-edge feature called "late-binding." Late-binding configures cloud resources on-demand based on the network function requirements and then automates this process on an ongoing basis. Late-binding addresses a fundamental issue for network operators: how to balance a set of heterogeneous vRAN and 5G core vendor requirements with consistent operations. Below, in Figure 2, we highlight the importance of late-binding for modern network requirements—specifically, how late-binding supports rapid Open RAN deployments at scale.
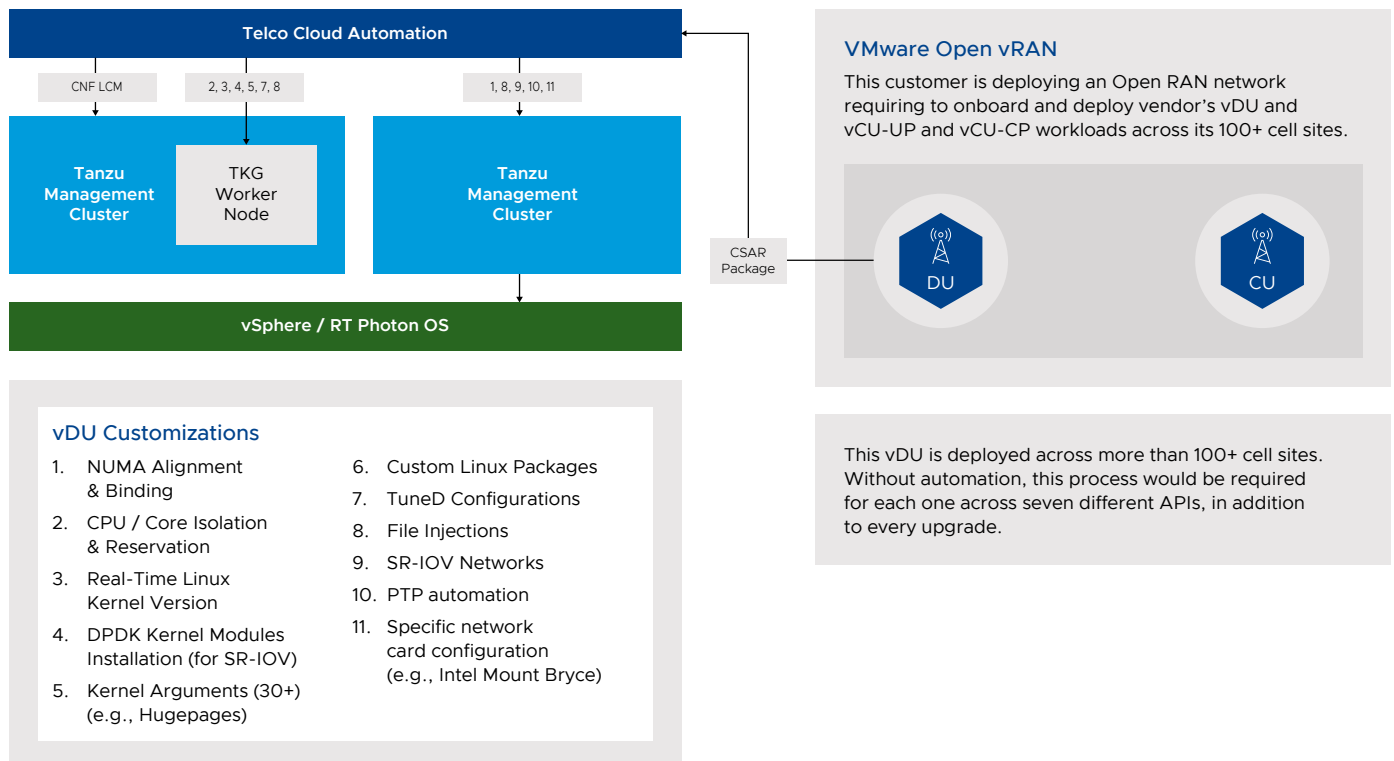
Telco Cloud Automation	

CNF LCM   2, 3, 4, 5, 7, 8   1, 8, 9, 10, 11

Tanzu Management Cluster | TKG Worker Node | Tanzu Management Cluster

vSphere / RT Photon OS

CSAR Package

VMware Open vRAN

This customer is deploying an Open RAN network requiring to onboard and deploy vendor's vDU and vCU-UP and vCU-CP workloads across its 100+ cell sites.

DU   CU

This vDU is deployed across more than 100+ cell sites. Without automation, this process would be required for each one across seven different APIs, in addition to every upgrade.

vDU Customizations

1. NUMA Alignment & Binding
2. CPU / Core Isolation & Reservation
3. Real-Time Linux Kernel Version
4. DPDK Kernel Modules Installation (for SR-IOV)
5. Kernel Arguments (30+) (e.g., Hugepages)
6. Custom Linux Packages
7. TuneD Configurations
8. File Injections
9. SR-IOV Networks
10. PTP automation
11. Specific network card configuration (e.g., Intel Mount Bryce)

Figure 2: Late-binding for modern network requirements

Infrastructure automation focuses on accelerating the network expansion by automating the provisioning software at new sites or adding compute capacity to existing ones.

Network Slicing for VMware Telco Cloud Automation offers new, differentiated services, as highlighted in Figure 3 below. Network Slicing allows CSPs to create and monetize a new breed of services—from Massive Machine Type Communication (mMTC) or Ultra-Reliable Low Latency Communication (uRLLC) to enhanced mobile broadband (eMBB)—through standard frameworks to design, create, and manage network resources that can be packaged and exposed directly to the end users.
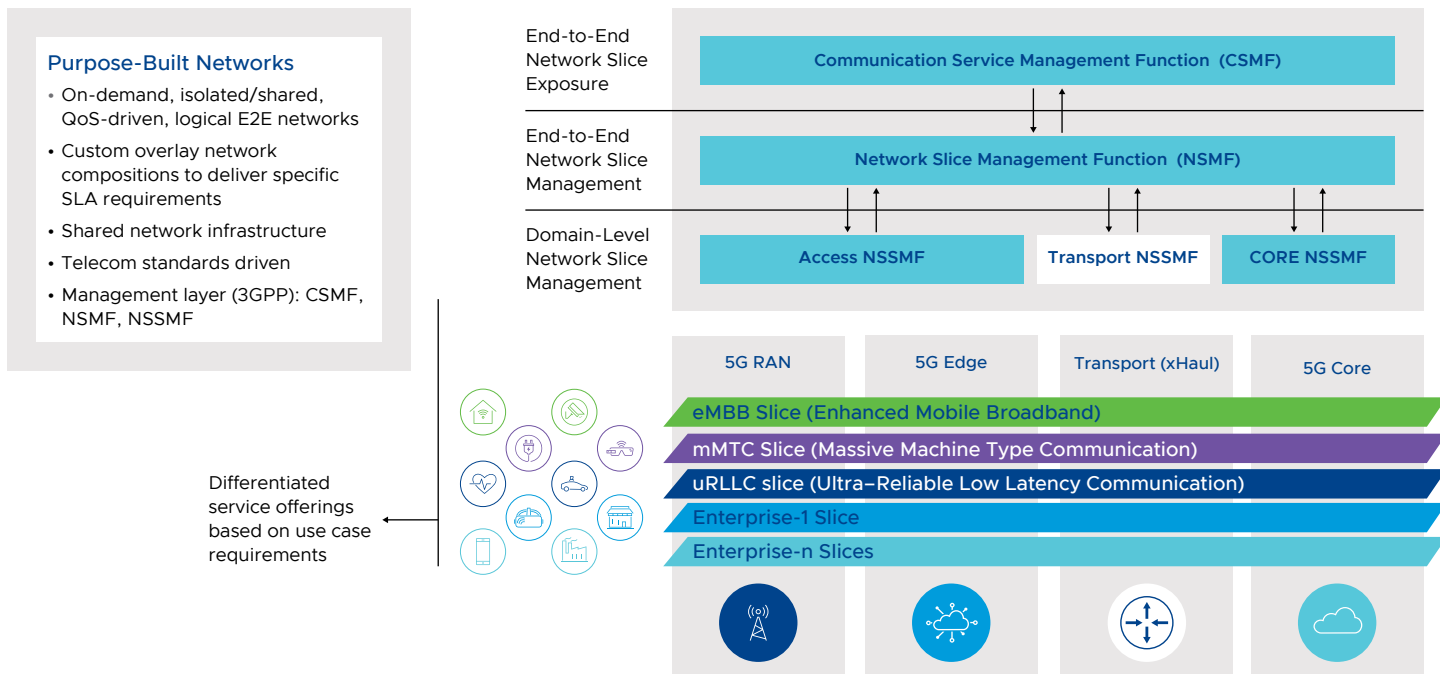
Purpose-Built Networks

- On-demand, isolated/shared, QoS-driven, logical E2E networks
- Custom overlay network compositions to deliver specific SLA requirements
- Shared network infrastructure
- Telecom standards driven
- Management layer (3GPP): CSMF, NSMF, NSSMF

Differentiated service offerings based on use case requirements

End-to-End Network Slice Exposure	Communication Service Management Function (CSMF)
End-to-End Network Slice Management	Network Slice Management Function (NSMF)
Domain-Level Network Slice Management	Access NSSMF	Transport NSSMF	CORE NSSMF

5G RAN | 5G Edge | Transport (xHaul) | 5G Core

eMBB Slice (Enhanced Mobile Broadband)
mMTC Slice (Massive Machine Type Communication)
uRLLC slice (Ultra–Reliable Low Latency Communication)
Enterprise-1 Slice
Enterprise-n Slices

Figure 3: Network Slicing for VMware Telco Cloud Automation

Key capabilities

- ETSI-MANO and cloud-native architecture integrate seamlessly into any telco cloud environment.

- Build services with multidomain orchestration.

- Bring unified management of workloads on-premises and on public cloud infrastructures, such as Amazon EKS.

- Deliver network resources through network functions and services on-demand and at scale across multiple clouds.

Operational efficiency and multi-cloud agility

VMware Telco Cloud Automation delivers operational efficiency at scale to accelerate time to market for new services, adapt existing services to meet customer demands, mitigate the cost of managing more complex networks and ultimately improve the customer experience. VMware Telco Cloud Automation enables multi-cloud operational agility through simplified design, onboarding, placement and management of network functions and services, across data centers and tenants of the telco cloud. Below we outline some key features associated with VMware Telco Cloud Automation:

Automate the network expansion

VMware Telco Cloud Automation centrally manages the provisioning and configuration of the telco cloud software stack / software-defined data center (SDDC) using pre-defined templates for the various site types of each telco cloud domain. The provisioning can be extended beyond the SDDC stack to include Kubernetes clusters and nodes in addition to network functions and services.

Key capabilities (continued)

- Optimize network resources and deliver new services through network slicing management.

- Leverage cloud providers' infrastructure for both on-premises and public multi-cloud management.

- Automatically tailor infrastructure and Kubernetes nodes to fit specific workload requirements ("late-binding").

- Gain operational efficiency through repeatability across network functions, services and infrastructure.

- Onboard virtual network functions (VNFs) and cloud-native network functions (CNFs) using compliant-based templates.

- Model network services based on multivendor network functions and a combination of technologies (VNF/CNF) with service chaining.

- Optimize cloud resources and processes with intent-based placement.

- Automate network functions, services, CaaS and infrastructure lifecycle management.

- Centralize the creation, optimization and management of Kubernetes clusters with CaaS automation.

- Simplify CI/CD integration to facilitate software upgrades.

- Expand existing sites or provision new sites automatically through zero-touch provisioning (ZTP) and site templates.

- Gain 360˚ awareness of the telco cloud from infrastructure provisioning to instantiated functions and services.

- Achieve end-to-end telco cloud service assurance with VMware Telco Cloud Service Assurance integration.

Unified automation for NFV and cloud-native networks

VMware Telco Cloud Automation aligns the process for managing network functions and services over container and VM-based infrastructures while abstracting differences through underlying integrations and automation capabilities. The lifecycle management of network functions (both VNFs and CNFs) are managed with the same user interface or through standard-based APIs utilizing shared catalog, inventory and frameworks for Days 0, 1 and 2 operations.

Multilayer automation for the telco cloud

VMware Telco Cloud Automation delivers lifecycle management automation for network slices, network service, and network functions. VMware Telco Cloud Automation effectively manages and automates Kubernetes clusters and virtual infrastructure over a single, centralized platform, typically requiring discrete tools offered by diverse vendors. Each module is self-contained, and the combination of modules enables advanced automation capabilities to optimize placements and customize infrastructure to support network function requirements. This suite of customizations to the Kubernetes clusters/nodes, OS and VM drastically reduces the time to deploy network functions in the core, edge and RAN while maximizing resource utilization at each site.

Proactive management of telco cloud software

VMware Telco Cloud Automation's centralized management enables observability on fault and performance indicators of the applications' virtual resources and instantiated software. This information coupled with automated Day 1 and Day 2 operations (healing, scaling, etc.) enables closed-loop action for issue remediation. The platform also extends to integrate with CSPs' AIOps or through VMware's Telco Cloud Service Assurance platform through standard interfaces for end-to-end root-cause analysis and the application of custom resolution workflows.

Streamline the orchestration journey

VMware Telco Cloud Automation delivers a cloud-smart solution where all layers—from infrastructure to domain orchestration—are coupled for consistency, optimized deployment and workload management across clouds. VMware Telco Cloud Automation supports hybrid networks and is the management plane of the VMware Telco Cloud Platform for 5G, RAN and edge.

Centralized management for cross-domain and multi-cloud modern networks

VMware Telco Cloud Automation is a cross-domain orchestration and automation platform supporting core, edge and RAN virtual domains over a distributed and multi-cloud infrastructure. For each domain, and through the same management plane, the platform delivers multilayer automation of the cloud components, including network slicing, network service, network function, container and VM-based infrastructures. Furthermore, the platform extends its multi-cloud capabilities to hyperscaler clouds, such as Amazon EKS, and other upstream Kubernetes distributions.

Built for a thriving open multivendor ecosystem

While many vendor ecosystems inherently restrict interoperability, VMware Telco Cloud Automation follows ETSI guidelines. The network function manager and domain orchestrator are used as combined or standalone modules interfacing ETSI SOL-compliant components of the MANO framework— operating support system (OSS), business support system (BSS), element management system (EMS) / VNFM, etc. The solution xNF composer, coupled with the VMware Ready for Telco Cloud program, bolsters innovation and interoperability—providing ready access to new capabilities.

Learn more

Visit telco.vmware.com/products/ telco-cloud-automation.html to learn more about how VMware Telco Cloud Automation can help you leverage the telco cloud to its full potential.

Call 877-4-VMWARE (outside North America, +1-650-427-5000) or visit telco.vmware.com.

Product and cloud-smart approach to automation

VMware Telco Cloud Automation integrates natively with the VMware Telco Cloud products, and these integrations are maintained for each new version. CSPs do not need to worry about planning and rebuilding all the integrations for every release. VMware Telco Cloud Automation deploys a control-plane function at each cloud integrated with VMware infrastructure to automatically enable the proper placement and operations based on ubiquitous knowledge of the available multi-cloud resources and capabilities, avoiding rollbacks and misuse of the infrastructure.

Standard-compliant and open automation platform

VMware Telco Cloud Automation was designed from the infrastructure up to initially bridge CSPs to the cloud and now the multi-cloud. The platform supports telco standards, including 3GPP, ETSI-MANO, TMF and O-RAN. Any network function compliant with ETSI-MANO standards can be onboarded onto the platform catalog. The product offers a composer that quickly aligns network function vendors with the required standards along with support through the VMware Ready for Telco Cloud certification team. Specific extensions are also added to support CNFs. VMware's Ready for Telco Cloud program already offers hundreds of network functions for deployment on the VMware Marketplace™. The CSP networks' east/west/northbound systems interacting with VMware Telco Cloud Automation can also use ETSI, TMF and O-RAN standards, moving complex integrations into simplified validation. VMware Telco Cloud Automation also plays a key role to enforce CSPs' cloud-native automation ecosystem by providing a set of interfaces and libraries to quickly integrate continuous development, delivery, testing and integration pipelines for all telco cloud software.

INTEROPERABILITY		

Standard interfaces	• Ve-Vnfm-vnf: ETSI NFV IFA008/SOL002; VNF and NS descriptors compliant with IFA011/SOL001; VNF and NSD package format of IFA014/SOL004
	
	• Ve-Vnfm-em: Third-party EMS per ETSI NFV IFA008/SOL002
		• Or-Vnfm: ETSI NFV IFA007/SOL003
		
		• Os-Ma-nfvo: ETSI NFV IFA013/SOL005 and TM Forum
		• Network slicing management:
		  – Service Ordering: TMF641
		  – Service Catalog Management: TMF633
		  – Service Inventory: TMF638

Open architecture	• Modular NFVO / G-VNFM architecture, interacting through REST APIs and utilizing ETSI-MANO SOL003/IFA007 API standards • Pre-built integration with VMware telco and cloud technologies (including vRealize® and Telco Cloud Service Assurance)	• Support Ansible Playbooks and ConfigMaps for commissioning • Simplified integration with third-party OSS, VIM, VNF, SDN-C and S-VNFM • Support for 3GPP network slicing management functions: CSMF, NSMF and NSSMF
VMware actively cooperates with multiple network function vendors including all key NEPs, having them certify in the VMware Ready for Telco Cloud program. This is a comprehensive certification program that ensures interoperability and operational readiness between third-party-developed network functions and the ETSI-compliant VMware Telco Cloud platform. The program helps ensure that CSPs can rapidly onboard and deploy multivendor network functions with the VMware Telco Cloud platform. VMware Telco Cloud Automation leverages this program to certify interoperability with network function vendors, offering a neutral and pre-tested end-to-end solution.		