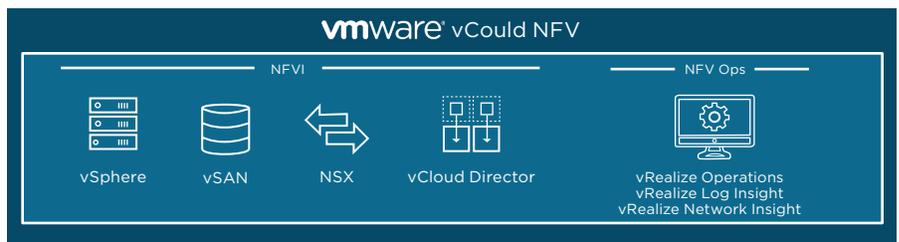# VMWARE VCLOUD NFV

vCloud Director Edition

AT A GLANCE

VMware vCloud® NFV™ is a modular, multi-tenant NFV platform that allows CSPs to accelerate time to market, increase revenue through new services, streamline operations, and reduce network infrastructure costs. Built on industry-leading virtualization, management, and operations solutions, the platform provides several transformative capabilities essential to modern telco networks such as control and user plane separation (CUPS) for distributed 5G architectures, hybrid execution environment supporting VMs and containers, acceleration for data-plane workloads, multi-vendor VNF onboarding and rapid service delivery, and use of open source technologies for interoperability and rapid innovation.

About VMware vCloud NFV vCloud Director Edition

VMware vCloud NFV is a modular NFV platform that several of the world's leading CSPs rely on to develop modern cloud computing stacks to support new revenue streams while lowering costs. The ETSI-compliant NFVI platform supports a broad set of VNF applications creating a large ecosystem for CSPs to deliver innovation at a rapid pace at scale. Its flexible platform architecture allows CSPs to deploy applications and services today for 4G networks, deploy services at the edge, and then seamlessly migrate to 5G networks.

vCloud NFV 3.0 vCloud Director Edition includes several new capabilities that allow CSPs to quickly introduce and have full control over distributed micro data centers and apps at the edge via automated API-driven orchestration and lifecycle management. vCloud Director for Service Providers 9.5 integrates natively with VMware NSX-T to deliver advanced networking features and accelerated data path performance, while simultaneously supporting NSX-V deployments from the same VIM instance. Organization virtual Data Center (Org VDC) constructs in vCloud Director allow creation of virtual data centers for tenants, offering tenant resource guarantees and specific SLA levels for each telco workload and multi-tenant Role Based Access Controls (RBAC) to create global tenant roles and rights bundles.

vCloud NFV 3.0 includes vRealize Operations Manager 7.0 which contains several major new operations management functionalities including integration with vRealize Orchestrator for closed-loop performance remediation, granular workload deployment policies for policy-based assurance, CPU-aware vMotion, and proactive and predictive analytics for just in time forecasts and performance remediation.

With a large ecosystem of certified VNFs that accelerates service creation and VNF on-boarding, and continuous evolution of platform interfaces to meet changing market requirements, VMware vCloud NFV provides CSPs with a single platform capable of supporting all business functions today and for the future.

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Building Blocks

VMware vCloud NFV vCloud Director Edition combines a carrier grade NFV infrastructure with VMware® vCloud Director™ as the NFV Virtualized Infrastructure Manager (VIM), providing a platform to support CSP network modernization and business transformation.

The vCloud NFV platform includes industry leading virtualization products – VMware vSphere™, VMware vSAN™, and VMware NSX™, a choice of Virtualized Infrastructure Managers (VIMs) – vCloud NFV OpenStack™ and vCloud Director™, and NFV operations management capabilities including vRealize Operations, vRealize Log Insight, vRealize Network Insight, and vRealize Orchestrator.

VMware vSphere provides carrier-grade virtual compute designed to run modern and traditional applications side by side for optimized performance, high availability, fault tolerance, and workload optimization. VMware vSAN offers simple hypervisor-converged storage embedded in the hypervisor that can be co-located with the VNF workloads to minimize jitter and latency. VMware NSX enables granular overlay networking and security at the hypervisor level, providing distributed network services for VNFs including granular network isolation using NSX micro-segmentation and simplified operations.

VMware vRealize® Operations Manager™, vRealize Log Insight™, vRealize Network Insight™, and Site Recovery Manager™ are fully integrated and provide real-time NFV operations monitoring, analytics, and optimization.
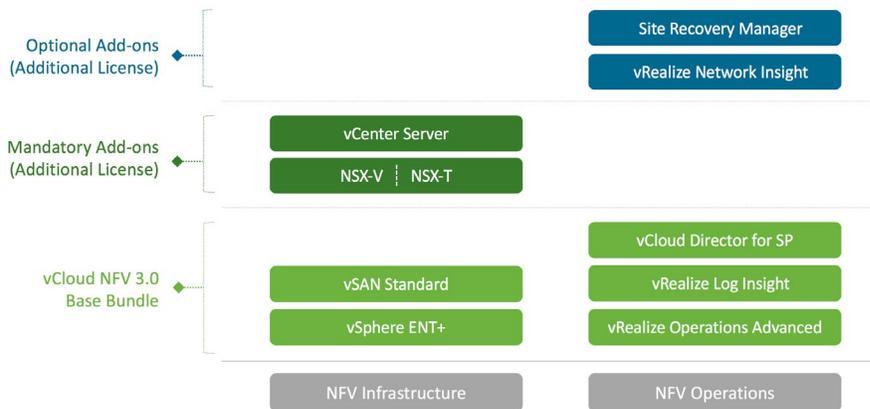
The vCloud NFV vCloud Director Edition platform implements a modular design with abstractions that enable multi-vendor, multi-domain, and hybrid physical, and virtual execution environments. The platform also delivers an automation framework to interoperate with external functions for service orchestration and management, and a fully integrated suite for operational intelligence and monitoring. This suite can be used to further enhance the runtime environments with workflows for dynamic workload optimization and proactive issue avoidance.

Note: For specific component versions and supported functionalities, please refer to the VMware vCloud NFV vCloud Director Edition release notes.

Key Capabilities and Benefits

VMware vCloud NFV provides several advanced features and capabilities aiding successful NFV deployments and evolution:

Secure Multi-tenancy and Enhanced RBAC

Securing multi-tenant cloud environments drives the need for tenant isolation. Not only should tenants not be able to communicate with each other without explicit permission, tenants should also have an independent view of their network, and peak loads should not affect neighboring tenants. vCloud NFV delivers this secure multi-tenant isolation by offering:

- Org virtual Data Center (vDC) constructs that allow creation of virtual data centers for tenants, offering tenant resource guarantees and specific SLAs for each telco workload
- NSX-T network multitenancy that uses a two-tiered architecture to implement provider and tenant separation of administrative control across the logical switching and routing fabric
- Multi-tenant Role Based Access Controls (RBAC) model that allows CSPs to create global tenant roles and rights bundles
- Tenant Self-Service RBAC for self-service management of permissions for tenant users by their own administrators without needing service provider involvement

Efficient Multi-cloud Deployments

5G services require a mix of low latency, high throughput, and high user densities and concurrences. Optimal performance requires a sophisticated service delivery model, a network that supports a mix of highly distributed and centralized functions, and a new way of managing network and infrastructure resources. vCloud NFV achieves the scale and manageability required to efficiently deploy and operate multi-cloud deployments through:

- Efficient cloud services management with the flexibility to deploy centralized VIM for a common management plane across sites or a distributed architecture with federated management
- Multi-site image replication, global and per-site resource/quota management for unified multi-cloud resource scheduling across compute, storage, and networking resources
- Cloud scale performance using a distributed control plane architecture enabled by decoupling NSX-T Data Center functionality from vCenter server
- A mature NFV ecosystem of deployment-ready VNFs that have undergone comprehensive testing and certification with the VMware Ready for NFV program

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Deterministic Performance

vCloud NFV vCloud Director Edition includes several features to support workloads that require high performance, delivered with the newly available N-VDS with Enhanced Data Path Mode. This high-performance capability is available through the DPDK based enhancements in the NSX-T Data Center, including optimizations through poll mode drivers, CPU affinity, buffer management, and DPDK support. North-South traffic forwarding between logical and physical domains can benefit from bare metal NSX Edge Nodes. Benefits include:

- Ease of allocating compute resources to N-VDS for data-plane intensive workloads

- Automated NUMA alignment that automatically aligns the VNF processing cores, the PMD logical CPU cores, and the physical NIC on the same NUMA node for high performance

- Support for key vSphere functionality like High Availability, vMotion, and Distributed Resource Scheduler

- Separation and isolation of data plane workloads from control plane and management plane workloads, enabling CUPS based architecture

- Improved performance through multi-tiered routing, bare-metal edges, HugePages support up to 1GB for high performance Translation Lookaside Buffers

Advanced Networking

CSPs are increasingly seeking networking and security platforms that provide consistent connectivity, QoS, integrated security, and inherent automation to operate a robust end-to-end architecture that delivers applications and services, when and where needed. vCloud NFV facilitates this fundamental shift in networking capabilities by delivering:

- Dual stack support for NSX-V and NSX-T in the same vCloud Director instance that manages virtualized switching, routing, firewalling, and load balancing

- Context-aware NSX micro-segmentation to deploy security policies both within and between VNFs in both VM and container form factors

- N-VDS Enhanced and N-VDS Standard switches on the same host allowing user plane and control plane VIFs of the same VNF to connect to different switches

- Bidirectional Forwarding Detection (BFD) of link failures for increased network resiliency

- Distributed stateful firewalling, DNS as a Service (DNSaaS), and Load Balancer as a Service (LBaaS) for L4-L7 load balancing

- Consistent allocation and enforcement of network bandwidth, throughput, latency, and other network resources in VMware NSX-T

- ERSPAN port mirroring for packet analysis, troubleshooting, and security

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Intent based Assurance

CSPs are often constrained by traditional operating models which may have worked for a specific pre-defined set of services but were rigid and inflexible. Deploying new services on-demand, with real-time scaling, monitoring, and remediation, has now become imperative. With intent-based assurance, vCloud NFV includes a new paradigm in network operations that delivers:

- Automatic placement and rebalancing of workloads across clusters and datastores to avoid resource contention and ensure performance

- Advanced policy-based assurance with express deployment policies that segment workload placement based on licensing, resource management policies, and latency-based placement

- Tight integration with vRealize Orchestrator Integration with closed-loop workflows for advanced performance remediation.Automated moving of VMs including Distributed Resource Scheduler (DRS) levels, predictive DRS, storage DRS, CPU-aware vMotion, storage policies and target utilization levels

- Intent-based policies for SLA, application license, forecast, and cost

- Tenant-level real-time predictive analytics to improve capacity utilization, capacity risk detection, automatic resource reclamation, and right sizing of resources

- Deep network visibility with automatic topology discovery, converged overlay and underlay visibility, and real-time network insights via vRealize Network Insight

- Extensible operations management with APIs for northbound integration and automation

Use Cases

Virtual IMS (vIMS):

Virtualizing the IMS gives CSPs a cost effective, flexible solution to deploy IP telephony services such as VoLTE. With simplified provisioning, accelerated network performance, optimized resource management, logical networking and security, QoS and monitoring, and a vast VNF ecosystem, vCloud NFV ensures top performance, security, and service resiliency to launch vIMS services faster to market.

Virtual EPC (vEPC):

The explosion of data and devices is driving CSPs to an agile, virtual network that scales with new innovative services while reducing complexity and costs. vEPC is a key enabler in CSPs streamlining the network core for emerging 5G and IOT services. The multi-tenant vCloud NFV platform helps operators accelerate customer onboarding, optimize the Quality of Experience (QoE) and network utilization through dynamic capacity allocation, and expand to differentiated services with flexibility in footprint and scale.

Virtual Customer Premise Equipment (vCPE):

Virtualizing Customer Premises Equipment allows CSPs to host services in their cloud and give customers the flexibility to select services when and where they want. vCloud NFV lays the foundational fabric for vCPE, enabling CSPs to accommodate increasing network complexity, meet continued growth in demand, and add value-added services including v-FW, v-IDS, v-VPN, v-SBC, and v-IP-PBX.

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CARRIER-GRADE SUPPORT

VMware offers a broad spectrum of support options, ranging from self-help and basic support to business and mission critical offerings, including:

- Add-on services to Production Support

- New SLAs for service restoration of NFV platform

- MCS SLAs for enterprise environments

- Dedicated support teams, 24/7

- Dedicated Service Account Manager

- Enhanced proactive and reactive support

- Limited onsite support as required, or option to purchase on-site resident assistance

For additional information, click here.

Edge Services:

By making edge computing services available across the network, CSPs can drive the adoption of next-gen applications at the network edge, including CDN, traffic steering/shaping, location services, video processing, augmented reality, connected cars, and security and compliance. The benefits of carrier-grade performance, service continuity, and cloud orchestration, along with service separation in a multitenant shared infrastructure, make vCloud NFV a compelling area of investment for CSPs.

Software-Defined WAN (SD-WAN):

As enterprise applications move to the cloud, delivering services to branch offices requires new level of service reliability, application performance and security that SD-WAN offers. CSPs can leverage vCloud NFV to simplify deployment of SD-WAN services, centralize orchestration and operations management, and programmatically provision integrated networking and security functions which provide a complete set of logical networking services including switching, routing, QoS and monitoring.

IoT/Connected Car:

The tremendous growth in IoT presents several opportunities for CSPs, particularly in the automotive vertical. The connected car is a focus of intense innovation where CSPs can provide converged communications, differentiated service levels, aggregated data intelligence services, hosted and managed cloud services, and service chaining. The vCloud NFV platform delivers the differentiated classes of service, optimized resource allocation, integrated operational intelligence, and transport-to-application level security required by CSPs to capitalize on the opportunities presented by automotive IoT.

Reference Architecture

The vCloud NFV vCloud Director Edition can be deployed in the data center to meet target design and scale objectives. The vCloud NFV vCloud Director Edition Reference Architecture provides guidance for designing and creating a Network Functions Virtualization (NFV) deployment using VMware vCloud NFV vCloud Director Edition.

The vCloud NFV vCloud Director Edition Reference Architecture is available in the RESOURCES section on the VMware vCloud NFV page.

Learn More

For additional information about VMware vCloud NFV, call 1-877-VMWARE (outside North America, dial +1-650-427-5000), visit http://vmware.com/go/nfv.

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