TELCO OPERATIONS IN AN NFV WORLD

The Definitive Guide

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Operational Intelligence for NFV/SDN

5G's promise of network transformation through full "softwarization" will give communications service providers (CSPs) unprecedented agility and flexibility to deliver just the right combination of services to customers on demand. However, this agility and flexibility introduces a host of operational challenges that CSPs must address in order to make this network transformation efficient and cost effective.

Service onboarding, performance monitoring, and dynamic optimization are primary considerations. And well-designed operations management strategies must achieve or accommodate simplification, multitenancy, proactivity, and efficiency.

CSPs understand that a shared infrastructure layer, dynamic re-sizing and movement of workloads, distributed topologies, and owned and leased cloud environments will drive the need for self-correcting and self-adjusting automation. The operational intelligence CSPs need to manage such dynamic environments must feature just-in-time analytics to trigger components of the network functions virtualization (NFV)/software-defined networking (SDN) ecosystem to action cross-tier functions – service, network, virtualization and infrastructure – and must offer a single line of sight for monitoring and resolution.

Operational Intelligence for NFV/SDN

Today, astute organizations understand the importance of managing Day 0, Day 1 and Day 2 requirements with operational intelligence that can address the following:

- Single pane visibility across hybrid cloud environments
- Dynamic discovery, cross-tier correlation, and huge multitenancy
- Performance monitoring with predictive intelligence
- Causality analysis with prescriptive recommendations
- Embedded demand forecasting and cost analysis
- Closed-Loop automation for dynamic optimization

Fortunately, VMware has engineered these capabilities and more into its vCloud® NFV™ platform through its Operational Intelligence components. VMware vCloud NFV is a fully ETSI-compliant network functions virtualization platform consisting of NFV Infrastructure (NFVI) and virtualized infrastructure manager (VIM). Operational Intelligence components are pre-integrated into the architecture and fully extensible to the non-VMware domain. Dynamic and real-time data intelligence is key in this architecture and provides closed-loop integration into the service orchestration, OSS, and VNF management domains.
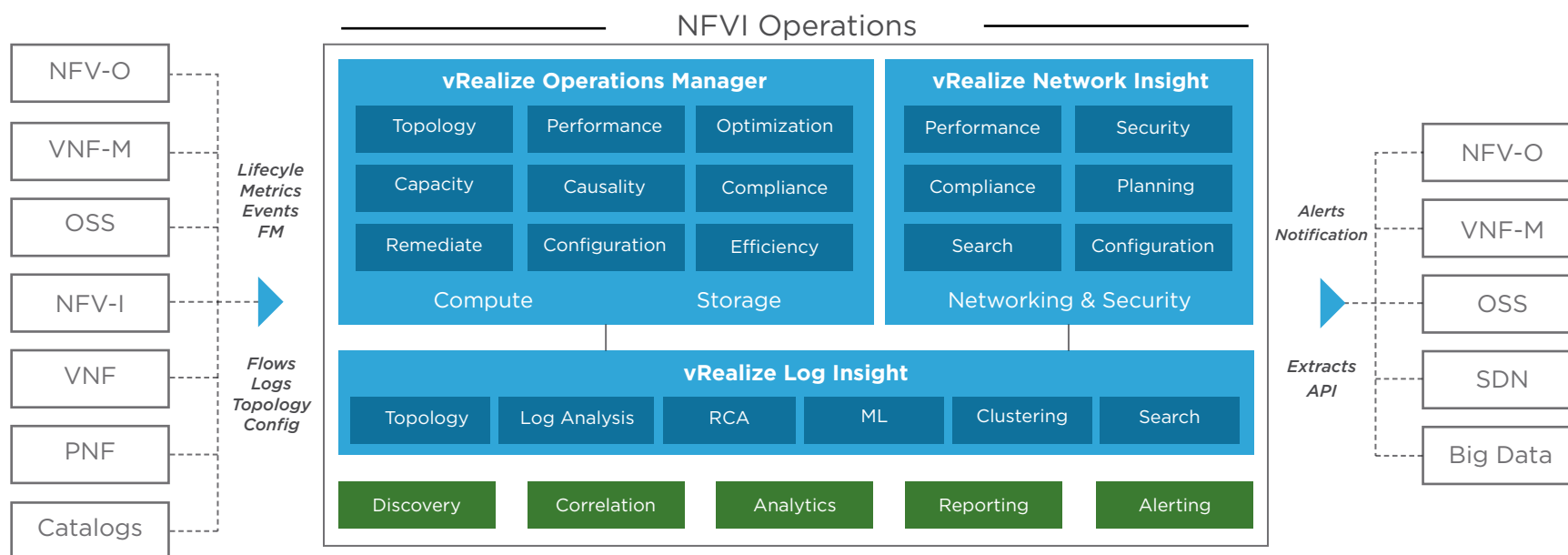
Operational Intelligence for NFV/SDN

The vCloud NFV Operational Intelligence framework provides CSPs with advanced service lifecycle capabilities, performance monitoring and resiliency, and improved performance and operational efficiency by providing an integrated view of the NFV infrastructure, services and applications. vCloud NFV integrates seamlessly into existing CSP operational environments and allows monitoring, management and troubleshooting of applications with a service-level view across any cloud, extending your existing operational workflows with an end-to-end view of the network.

vCloud NFV Operational Intelligence Framework

Intelligent operations management across the entire infrastructure

NFVI Operations

| NFV-O |
| VNF-M |
| OSS |
| NFV-I |
| VNF |
| PNF |
| Catalogs |

Lifecycle Metrics Events FM

Flows Logs Topology Config

vRealize Operations Manager

Topology	Performance	Optimization
Capacity	Causality	Compliance
Remediate	Configuration	Efficiency

Compute   Storage

vRealize Network Insight

Performance	Security
Compliance	Planning
Search	Configuration

Networking & Security

vRealize Log Insight

| Topology | Log Analysis | RCA | ML | Clustering | Search |

| Discovery | Correlation | Analytics | Reporting | Alerting |

Alerts Notification

Extracts API

| NFV-O |
| VNF-M |
| OSS |
| SDN |
| Big Data |

VMware vCloud NFV Operational Intelligence Components

NFV requires a robust solution to manage CSP operational processes across a hybrid virtual and physical environment. Traditional approaches to integrating operational intelligence across the ecosystem with hardware-based vertical solutions are not sustainable or viable. vCloud NFV provides a simplified operations management solution that is fully integrated into the platform, enabling a single-pane, 360-degree monitoring and analytical solution function as soon as the system is turned up.

At the core, VMware vRealize® Operations™, VMware vRealize® Log Insight™ and vRealize® Network Insight™ provide the monitoring, alerting, proactive avoidance, issue isolation, and remediation capabilities.
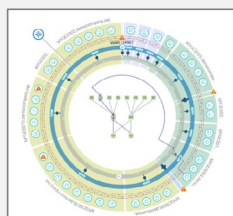
vCloud NFV Operational Intelligence Components
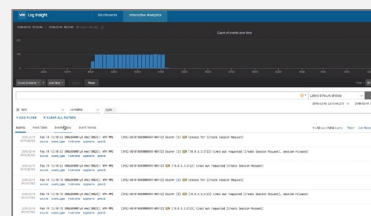
vRealize Operations
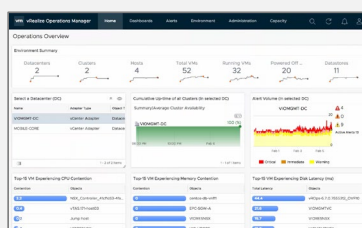
- Structured Data - Metrics, Events, Alerts
- Continuous monitoring and Prioritized troubleshooting
- Actionable recommendations
- Self-Healing operations

vRealize Network Insight

- Operational Intelligence for Networking and Security
- Converged visibility across virtual and physical
- Network traffic analysis and recommendation for micro-segmentation

vRealize Log Insight

- Unstructured Data - virtual and physical
- Log Analytics
- Root cause analysis
- Proactive Issue Isolation
- Centralized log warehouse

vRealize Operations (vROps) – vRealize Operations Manager provides single-pane visibility into all components within a telco service – from the underlying hardware to the hypervisor, networking, virtual machines that make up the VNF, and the service itself.

vRealize Network Insight (vRNI) – vRealize Network Insight provides full visibility into virtual and physical networks as well as security engineering analytics. vRNI provides network and security intelligence to help increase SLAs, manage east-west and north-south security policies, and expedite issue isolation.

vRealize Log Insight (vRLI) – vRealize Log Insight captures all unstructured data from the telco environment and provides log analysis and analytics for issue isolation based on machine-learning pattern recognition and filtering.

New Business Models Require Agile Operations

VMware vCloud NFV takes a full lifecycle approach to operations management. It incorporates core attributes such as simplification, multitenancy, proactivity, and efficiency across all aspects of large-scale telco operations, including:

- Service onboarding
- Service launch
- Performance monitoring
- Issue isolation with machine learning
- Dynamic and predictive optimization
- Capacity planning and business management

New Business Models Require Agile Operations

This fully integrated operational intelligence computational platform provides a high degree of agility and efficiency out of the box, enabling seamless Day 0, Day 1, and Day 2 operations. In addition to keeping the lights on and ensuring the highest degree of service quality, the Operational Intelligence framework also provides real-time service optimization and forecasting capabilities integrated into a single solution.

Architected for modern cloud computing stacks and easy to deploy, VMware vCloud NFV Operational Intelligence represents a giant step closer to complete operations automation.

Onboarding Service Operations

Once tenant services have been deployed, the first step in operations management is to onboard the desired service operations functions. The Day 1 activities for the CSP operations manager typically include:

• Defining and discovering tenant service and resource boundaries

• Adding alerts and custom SLA triggers

• Creating custom dashboards for monitoring, alerting and remediation

• Discovering and planning security for east-west and north-south traffic

• Adding closed-loop integration and workflows for service orchestration

vCloud NFV Operational Intelligence delivers value out of the box by collecting, analyzing, and reporting on infrastructure data including logs, metrics, configuration data, and events.

Onboarding Service Operations

Service and Resource Discovery – Create custom service definitions from the pre-discovered topology of virtual machines, networks, and storage components in the vRealize portals. Create an EPC, IMS, or CPE boundary for a tenant spanning multiple data centers.

Multi-Tenant Dashboards – Extend the default portfolio of dashboards with custom views across the data center, cluster, and tenant. RBAC protects the dashboards and enables those for tenant self-servicing.

Alerts – Use the alerting frameworks to create custom metrics, symptoms, alerts, and actions to ensure system performance issues and SLA violations will be identified in a timely manner.

Micro-Segmentation – Let the system profile the east-west and north-south traffic flows to provide a golden state micro-segmentation plan. Export the plan into NSX Manager to enable the security groups and profiles at the appropriate infrastructure boundaries.

Flexible and Open Northbound API – Use the workflow engines of vRealize Orchestrator to create business process models to trigger northbound notifications to an internal or external system such as a VNF-M or NFV-O. Workflows created appear as actions in the alerting engine.
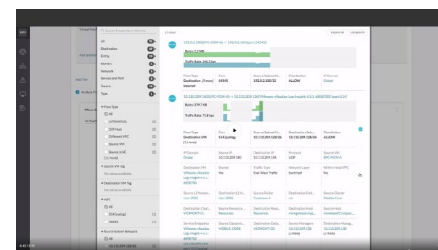
Service and Resource Discovery
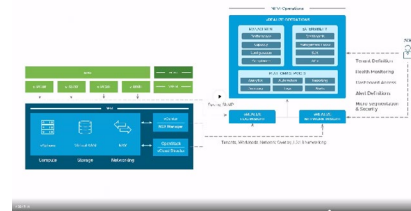
Create custom service definitions and tenant boundaries from auto-discovered topologies.

WATCH NOW ▶

Micro-segmentation and Network Discovery

Auto-profile E-W and N-S traffic flows to form a micro-segmentation plan and enable security groups and profiles at appropriate infrastructure boundaries.

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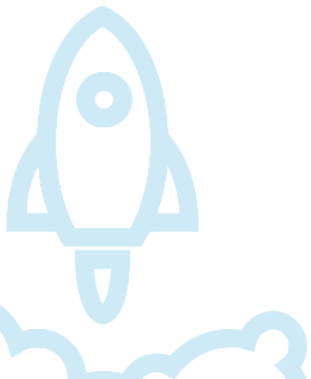# Launch Service and Operate

When the tenant services are up and running, CSP operations must monitor service health and continuously ensure that the SLAs are within bounds. Monitoring performance in the cross-tier landscape of services, virtual machines, data centers, clusters, and hosts typically includes:

- Watching for critical alerts

- Recognizing capacity constraints

- Identifying performance degradations

- Isolating other anomalies and more

vCloud NFV vRealize Operations retrieves capacity and performance statistics for CPU, memory, disk, and networking from across the telco service infrastructure and reports these to the operator from a single unified dashboard.

Launch Service and Operate

Availability, Performance, Capacity, and Security Monitoring – Quickly identify and analyze performance anomalies, faults, resource constraints, bottlenecks, and security alerts with in-depth views into all areas of the telco infrastructure. Enhance performance and avoid disruption with self-learning management tools that supply predictive analytics and Smart Alerts on application and infrastructure health.

API/SDK Access to Application, Data, and Developer Platforms – Open up your NFV operations to programmatic modification, automated workflows, and custom parallel UIs using REST APIs access to vRealize Operations Manager, Network Insight, and Log Insight. Query data repositories to poll monitored resources and metrics in your virtual environment, change product configuration, install or upgrade tools, configure access control, build interactive clients, and much more.

Interactive Dashboards and Analytics – Leverage prebuilt and customizable dashboards, reports, and views to provide real-time insight into the current state of your infrastructure and interactive visibility into the historical trends and future forecasts. Trend views provide predictions for capacity utilization and performance.

Unified Visibility from Applications to Infrastructure – Gain visibility across your multi-tenant, multi-vendor, multi-cloud environment. Enable unified visibility into all tiers of the environment including services (VNFs, PM, and FM), network (virtual and physical topologies, security), and infrastructure (hypervisor, OS, logical switching and routing).

Launch Service and Operate
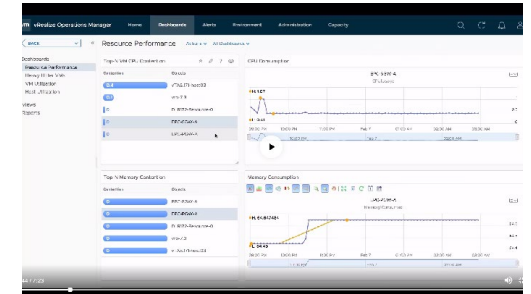
Analyze performance anomalies, faults, resource constraints, bottlenecks, and security alerts with in-depth views into all areas of the infrastructure leveraging self-learning management tools.

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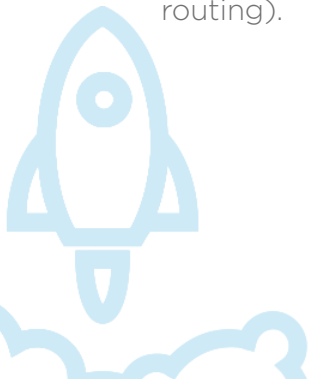
Dynamic Optimization

With tenant services up and running, the next operational challenge is to ensure that services continue to be offered at an agile cadence and the same stringent reliability and quality requirements. Automation leverages consumption patterns and available resources across hybrid clouds to optimize workloads continuously. The just-in-time operational intelligence is fed back into both the NFVI Distributed Resource Scheduler (DRS) and northbound API triggers to a service orchestrator to achieve predictive-class avoidance.

Automated Workflows for Closed Loop Optimization – Associate workflows with smart alerts to identify and automatically initiate corrective measures at critical thresholds. Useful pre-configured metrics and actions are available out of the box and can be triggered in the context of an alert or at any time.

Predictive Distributed Resource Scheduler (DRS) – Dynamically allocate and balance workloads to guarantee optimal access to resources and proactively avoid contention. Predictive DRS (pDRS) anticipates future demand based on utilization trends and rebalances workloads before contention occurs.

Pattern Recognition-driven Alerts – Self-learning algorithms and predictive analytics correlate monitoring data and provide intelligent alerts on underlying performance issues with clear recommendations for corrective action, enabling faster problem resolution. Dynamic thresholds adapt to your environment, significantly reducing false alerts. Alerts can be combined from multiple symptoms to generate a single alert that uses pattern recognition to focus on the underlying issue with clear recommendations and options to take action for remediation. Many of these alerts are configured out of the box but you can also create your own smart alerts.
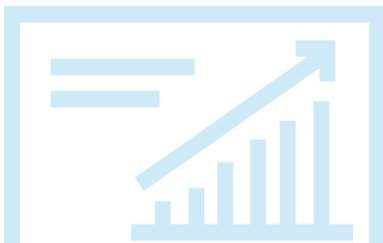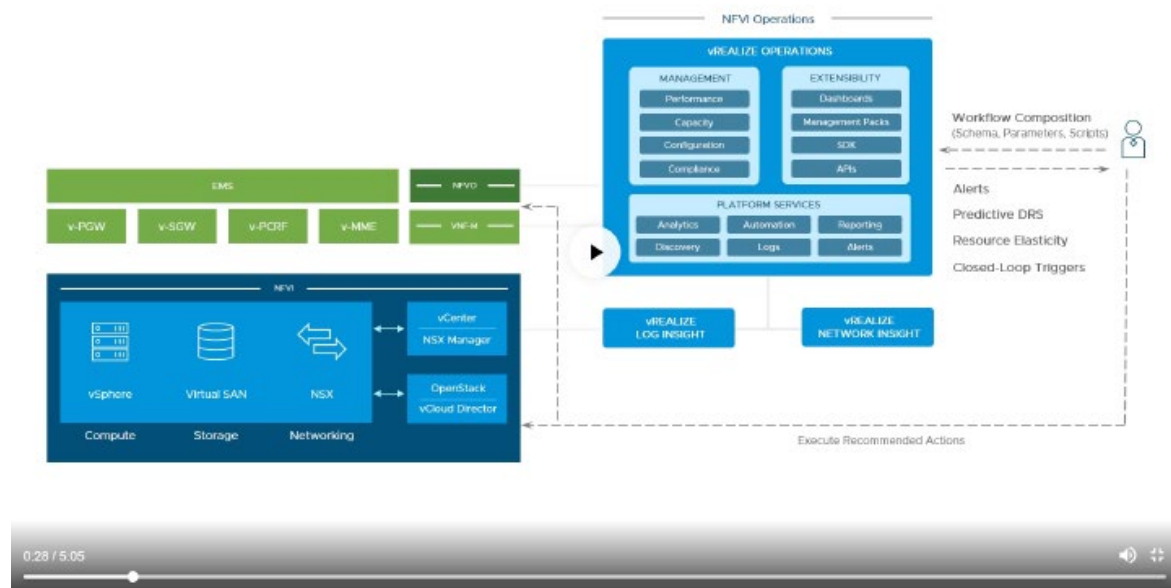
Dynamic Optimization

Dynamic Optimization and Issue Avoidance

Develop service agility while maintaining the stringent reliability and quality requirements of a carrier-grade network. Leverage consumption patterns across hybrid clouds to optimize workloads continuously using NFVI Distributed Resource Scheduler (DRS) and northbound API triggers to a service orchestrator.

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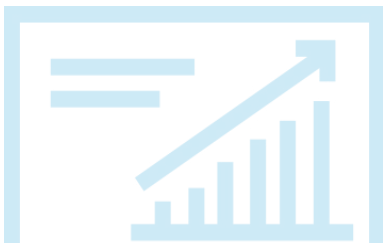
Issue Isolation

To this point, we have covered Day 0 to be able to plan and Day 1 to be able to deploy. Now we are facing Day 2 in which we operate the services built on the platform. What would CSP operations do on Day 2 when they face issues with the multi-tier, multi-cloud, multi-vendor virtual environment they operate in? Put another way...

You received an alert; now what?

• Follow the issue-isolation-orchestrated drill-downs into the services' compute, storage and overlay and underlay networking

• Use automatic machine-learned intelligence to find those needles in the haystack from a single log analysis interface

• See something you want to put under future observation; create an alert and add to the dashboard with the click of a button

vCloud NFV vRealize Operations provides faster issue isolation, shorter mean time to understanding with prioritized alerting, recommendations, advanced log searching, etc., and faster remediation:

• Isolation of service issues across physical and overlay networks

• Improved service reliability and availability
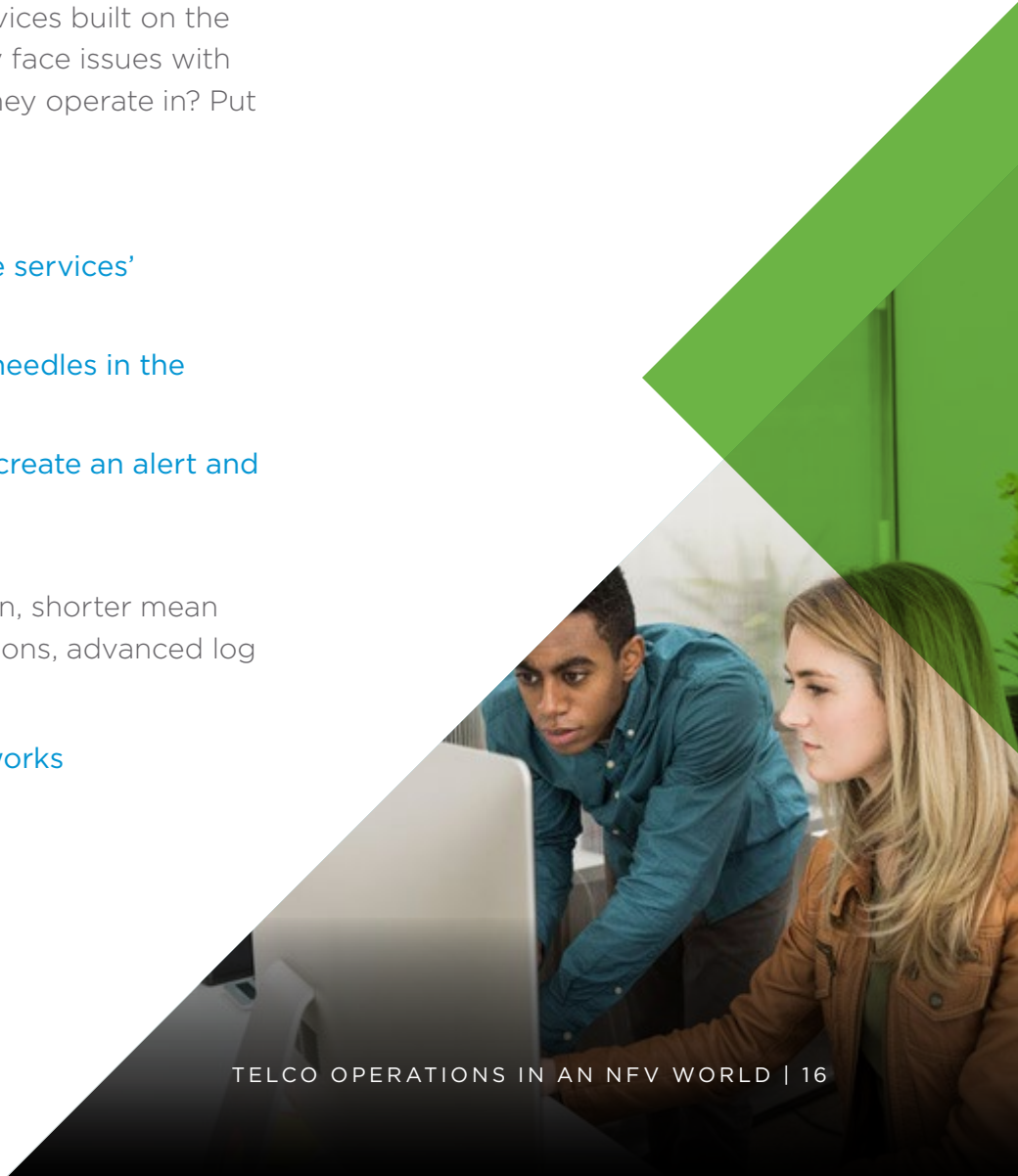
Issue Isolation

SLA Violations – Correlate unstructured log data with structured metrics and KPIs for comprehensive visibility into SLA violations and faster root cause analysis. Discover powerful, real-time log management and analysis to streamline problem remediation, stay in control and save time, effort and cost.

Performance Degradation Alerts and Recommendations – Take proactive management to a higher level through clear explanations and recommended solutions to performance, capacity and configuration problems.

Network and Application Visibility through Micro-Segmentation – Extend the capabilities of logical network overlay-based isolation: Provide a comprehensive analysis tool to model security groups and firewall rules, make micro-segmentation easier to deploy, and continuously monitor and audit compliance through granular network and application-level visibility and reporting across a network that spans racks or data centers independent of the underlying network hardware.

Underlay and Overlay Traffic Routes – Leverage the vRealize Network Insight dashboard to simplify troubleshooting by providing visibility into the traffic routes and conditions between various network elements. This includes the topology, capacity, and performance of the underlay and overlay virtual network.

Service Issue Isolation
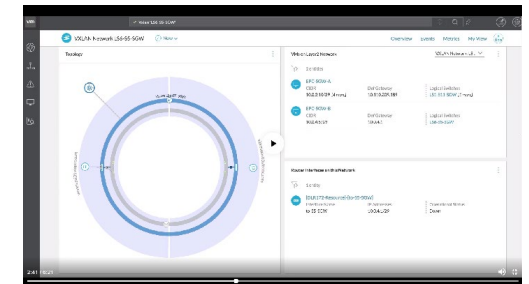
Realize rapid issue isolation, short MTTU with prioritized alerting, recommendations, advanced logging, etc., and faster MTTR across the stack leveraging integrated dashboards, issue isolation workflows, proactive avoidance, and closed-loop automation.

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Demand Planning and Expansion

Over-provisioning used to be the way to solve capacity challenges. But now, with vCloud NFV, dynamic demand monitoring feeds into an intelligent capacity planning engine which not only keeps capacities in check but also allows you to reclaim unused resources and create what-if scenarios for future demand forecasting and capacity exhaust.

Capacity and Utilization including Trending, Forecasting, and Remediation – Predict demand, anticipate shortfalls, and get recommendations. NFV-aware forecasting algorithms analyze historical capacity and utilization patterns to predict expected behavior of constrained resources such as CPU, memory, disk space and days to full.

Combined Operational and Business Insights – Plan capacity with cost awareness and cost-aware optimization opportunities using a unified understanding of overall utilization; identify opportunities to optimize further and plan ahead for on-premise and VMC clouds.

Procurement Planning – Enable efficient procurement planning. Reduce cost and risk with real-time, predictive capacity analytics correlated with cost analytics. Deliver optimal densification and proactive planning and procurement.

Resource Reclamation – Implement proactive capacity management, enabling you to balance utilization by reclaiming unused resources, effectively right-sizing the virtual infrastructure. This increase in efficiency frees up VMs and other resources that you can allocate to other projects, reducing costs and supporting growth.

Demand Planning and Expanision

Plan Demand and OI Expansion
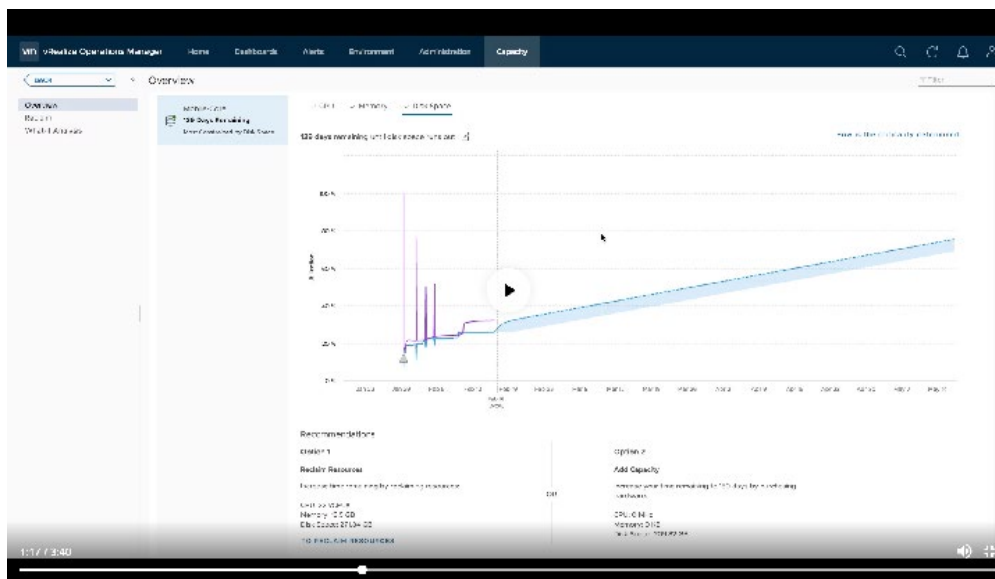
Intelligently plan capacity, reclaim unused resources, and create what-if scenarios for future demand forecasting and capacity exhaust leveraging dynamic demand monitoring and NFV-aware predictive analytics for a unified understanding of the virtual network functions (VNFs), infrastructure, and more.

WATCH NOW ▶

Final Thoughts

In your push to achieve NFV transformation, don't let intelligent operations be an afterthought. With a rich ecosystem of VNF partners and integrated end-to-end operational intelligence, VMware vCloud NFV improves performance and operational effectiveness by providing an integrated view of your NFV infrastructure, services and applications.

VMware vCloud NFV Operational Intelligence components feature core differentiators to give you the advantages you need to optimize service delivery and streamline costs:

Differentiated Customer Experience

Optimized QoS

SLA compliance

Reduced MTT U/R

Carrier-grade performance

Service innovation and new revenue

Enhanced Operational Efficiency

Horizontal platform for multi-vendor solutions

Cross-tier data correlation: physical and virtual

Capacity planning and forecasting

Multi-tenant, multi-domain operations

Lowered risk and DevOps cadence

Eliminated resource overprovisioning

Automation Worklows

Predictive analytics for issue avoidance

Automated remediation and workload optimization

Accelerated VNF on-boarding and service delivery

Machine learning with prescriptive alerting

Dynamic service chaining and self-service

Programmable network

vCloud NFV integrates seamlessly with your existing (and rapidly evolving) set of digital footprints and allows you to monitor, manage and troubleshoot your applications with a service-level view across any cloud. With vCloud NFV, you can extend your existing operational workflows with end-to-end visibility of network operations while continuing to use existing operational tools you have come to rely on for issue isolation and business continuity.

Don't let complexity become a way of life as you transform your operations to align with the digital transformation of your business. Achieving operational intelligence is easily within reach when you have the powerful VMware vCloud NFV platform behind you to provide real-time insights, automation and strategic decision-making tools to improve operational efficiency.

Additional Resources

vCloud NFV blog post on Operational Intelligence   >

1. Solution Brief: Enabling the Potential of NFV >

2. vCloud NFV Whitepaper >

Learn More

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