



VMware Telco Cloud Service Assurance

Automated service and network assurance for consistent 5G service delivery

At-a-glance

VMware Telco Cloud Service Assurance™ provides the best blend of virtualization and cloud technologies with infrastructure and service assurance

- **Single pane of glass across domains** simplifies NOC and SOC operations. Rapid insights across domains with integrated fault and performance management, service management, root cause and impact analysis.
- **Multi-vendor and multi-cloud** solution reduces complexity by monitoring, analyzing and proactively managing multi-vendor physical and virtual environments in a single platform.
- **Multi-layer assurance from infrastructure to services** reduces costs through automation and optimization across physical and virtual infrastructure, orchestration and service layers.
- **Closed-loop automation and rapid remediation** reduce OpEx and optimize resources and workloads to meet surges from edge and service requirements.
- **AI-based analytics** increase operational efficiency with rapid problem isolation, automatic suppression of extraneous alarms and automated rule updates.
- **Cloud-native platform** increases agility and flexibility to deploy on-premises, in public clouds and in hybrid multi-cloud environments.

Holistically monitor and manage complex 5G virtual and physical infrastructure and services end to end, from the mobile core to the RAN to the edge. From a single pane of glass, provide cross-domain, multi-layer, automated assurance in a multi-vendor and multi-cloud environment. Use operational intelligence to reduce complexity, perform rapid root cause analysis and see how problems impact services and customers.

5G challenges traditional service assurance

The 5G mobile network is enabling communications service providers (CSPs) to pursue new monetization opportunities that are tailored to an enterprise or consumer's needs. As CSPs look to provide on-demand as well as mission-critical services, end-to-end service assurance has become essential to ensure the quality of these digital services. New services must be operationalized in real time and managed proactively to meet quality expectations and service level agreements (SLAs). Downtime is not an option.

5G has been defined based on concepts of disaggregation, geographical distribution and cloud-native architectures. These features enable CSPs to deploy virtualized and containerized network functions that enable, for example, network slicing for customized enterprise services. To facilitate delivery of differentiated offers and manage large volumes of data, CSPs are adopting a cloud-native approach to provide agility and scalability. And, to support ultra-reliable low latency communications (URLLC) services, intelligence and data are moving to the edge of the network.

These powerful 5G innovations require a new approach to service assurance. Existing tools are inadequate silos unable to monitor and manage a multi-layer (from physical to service layers), multi-vendor, distributed and virtualized 5G environment. Containerized, cloud-native 5G deployments with thousands of virtual components and network functions make it extremely difficult to have clear visibility and deep insights into the infrastructure, as is needed for root cause analysis. Traditional manual fault identification and remediation processes are incapable of rapidly handling this complexity or the large volumes of 5G network data, events and alarms. Since traditional processes do not associate identified problems with the impacted services and customers, real-time SLA commitments that require high reliability and availability are jeopardized.

Operational intelligence and end-to-end automated 5G assurance

VMware Telco Cloud Service Assurance is designed from the start as a cloud-native architecture that provides the agility needed to monitor and manage 5G physical and virtual complexity end to end, from the mobile core to the RAN to the edge. On a single pane of glass, the solution provides integrated operational intelligence on 5G infrastructures across multi-vendor domains and physical, virtualized and containerized environments. Its open, automated assurance platform provides actionable insights in near real time and end-to-end visibility to physical, virtual and service layers. Closed-loop assurance and remediation capabilities cut across infrastructure, orchestration and service layers to manage real-time SLA and service quality conformance. VMware Telco Cloud Service Assurance integrates fault management, performance management, service management, root cause analysis and service impact analysis on a single platform.

Using VMware Telco Cloud Service Assurance's virtualization technologies and automated assurance, CSP network operations centers (NOCs) and service operations centers (SOCs) can manage their many networks as one to rapidly resolve network performance issues. Automatic association of issues with the affected customers or tenants enables prioritized remediation and consistent delivery of service quality. The result is reduced costs, increased operational efficiencies and higher customer satisfaction that enable CSPs to realize 5G monetization opportunities.

As part of the VMware Telco Cloud™ portfolio, VMware Telco Cloud Service Assurance (network monitoring and assurance product) integrated with VMware Telco Cloud Automation™ (network automation and orchestration product) provide the most powerful closed-loop automation and remediation in the industry. VMware Telco Cloud Service Assurance works with the underlying infrastructure and management layers such as VMware Tanzu® Standard (container and Kubernetes automation and management product), VMware Cloud Director™ and Integrated OpenStack for Telco Cloud Platform™ (5G RAN and core network function deployment), and VMware Telco Cloud Infrastructure™ (virtualization and VIM layer).

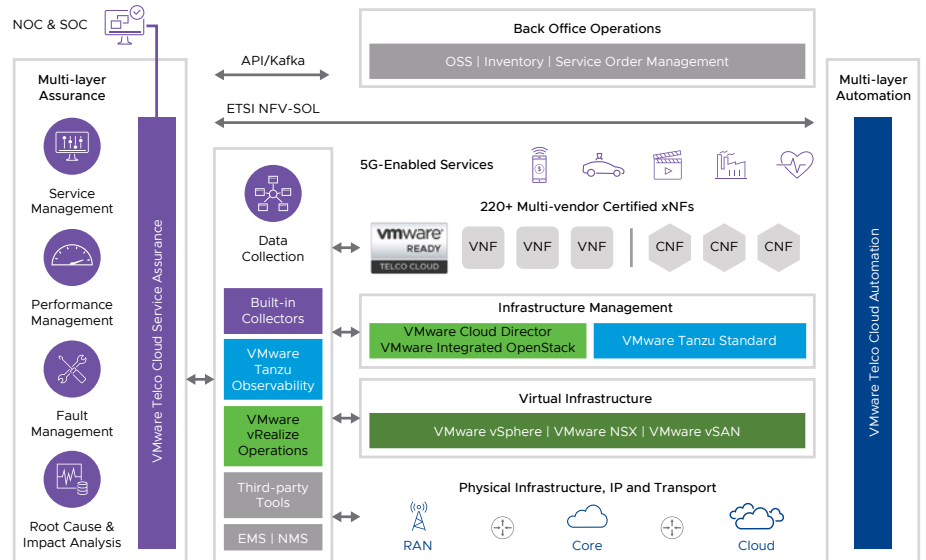


Figure 1: Telco Cloud Service Assurance—Multi-layer, cross-domain.

Service management that bridges the gap between operations and customers

5G services require reliable, high levels of service quality, which makes it essential to monitor and manage the network from a service and customer perspective. That requires making the connection between a network fault or performance degradation with the services and SLAs impacted.



Figure 2: Service Management.

Features

Multilayer visibility and monitoring with deep insights

- Across multi-vendor vRAN / O-RAN, xHaul and core
- Single source of truth for daily operations
- Integrated with NFV Orchestrator

Real-time health and performance analytics and dashboard

- Health and performance characteristics from the core to RAN
- Visibility to infrastructure health, across physical, virtual, CaaS, xNF and service layers
- Network slice mapping

Prioritized root cause analysis and business impact

- Identifies service loss or degradation across multidomain and multi-vendor stack
- Prioritize most-impacted customers based on SLA and mission-critical services

Closed-loop automation, operation and remediation

- Prescriptive root cause analysis and monitoring insights sent to orchestrators
- Automatic preventive actions can be taken for well-known and repetitive faults

Network slice and service health

- Monitored automatically
- Proactively analyze infrastructure trends and patterns that could impact service KPIs and SLAs
- Anomalies automatically identified and linked to root causes

VMware Telco Cloud Service Assurance bridges the gap between operations and customer care by automatically translating infrastructure failures into service impacts that affect customers or tenants. The solution identifies the technology and business objects affected by each problem, thus making a logical connection between the business context and the infrastructure issue. So that the most important issues are addressed with priority, VMware Telco Cloud Service Assurance automatically generates service health impact analysis results. Presented on a dashboard, a numerical impact value is associated with each problem so that operators can prioritize their support efforts.

Accomplishing proactive service management requires automated discovery of network functions and their relationships to services, as well as automated root cause analysis, proactive remediation and service impact analysis.

Automated discovery and topology mapping

Network functions are now a mix of physical, virtual and containers, making it difficult to understand interrelationships, how one function impacts others and how they relate to a 5G service or tenant. Each network slice, for example, could utilize completely different resources. To overcome this complexity, VMware Telco Cloud Service Assurance automatically discovers on-premises and cloud network resources in real time by using standard APIs. It then provides an end-to-end topology map, as illustrated below, on a single pane of glass that shows the physical and logical connectivity and relationships (e.g., parent and child) between the underlying network infrastructure and the various software components that compose the 5G service. This includes networking, hardware, virtualization, Container-as-a-Service (CaaS), application and functions layers for multiple vendors and domains. More than 4,000 physical and virtual devices are supported.

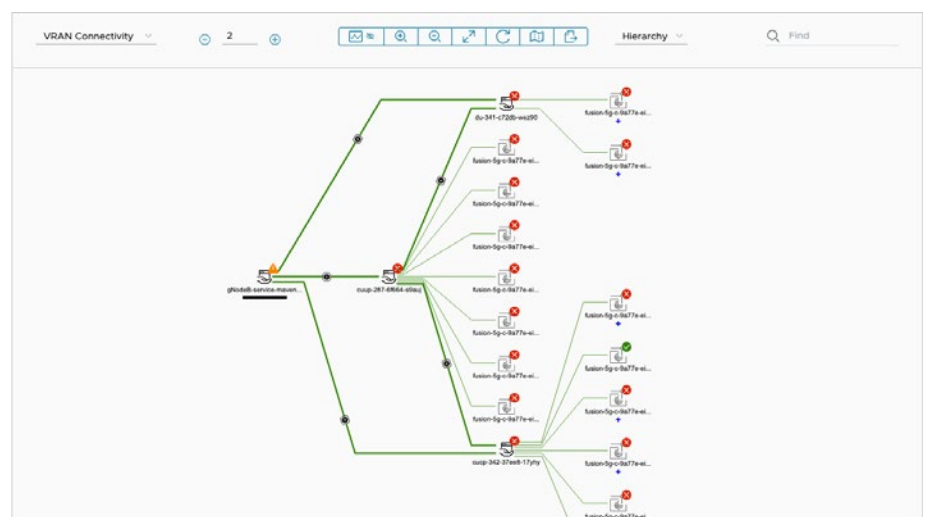


Figure 3: Topology discovery and mapping across core, transport and RAN infrastructure.

Features (continued)

Multitenant, multi-vendor management

- Monitor multi-vendor cloud, LAN and WAN solutions in a unified view
- Monitor and proactively manage multiple customers with diverse environments within a single ecosystem
- Visualize, analyze and optimize environments to enable fast resolution times and high availability and meet stringent SLAs

Reduced OpEx spending

- Auto-discovery of root cause
- Prioritization based on business impact
- Automated actions and remediations

Increased uptime and reduced MTTI and MTTR

- Cross-correlation between services, protocols and infrastructure
- Prescriptive diagnosis of the root cause of problems

Integration with standard orchestration tools

- Integration with industry-standard orchestration tools (e.g., OSS, VNF-M, NFV-O)
- Integration with VMware Telco Cloud Automation
- Enables closed-loop automation and remediation with underlying network functions and services

Intelligent fault and performance management

Using artificial intelligence and machine learning, VMware Telco Cloud Service Assurance automatically establishes dynamic performance baselines and calculates real-time performance metrics. It identifies anomalies or performance degradation and alerts operators when anomalous behavior is detected. Operational efficiency is increased with automatic suppression of thousands of extraneous alarms and elimination of costly manual upkeep of static rules. Resources and workloads are optimized dynamically to meet ebbs and surges of edge and service requirements.

End-to-end fault and performance monitoring results across physical and virtual layers are visualized graphically, as shown below. Because VMware Telco Cloud Service Assurance has a contextual topological view of both the underlay and overlay networks, CSPs can accurately triage situations and take proactive steps to prevent serious impacts to application performance.

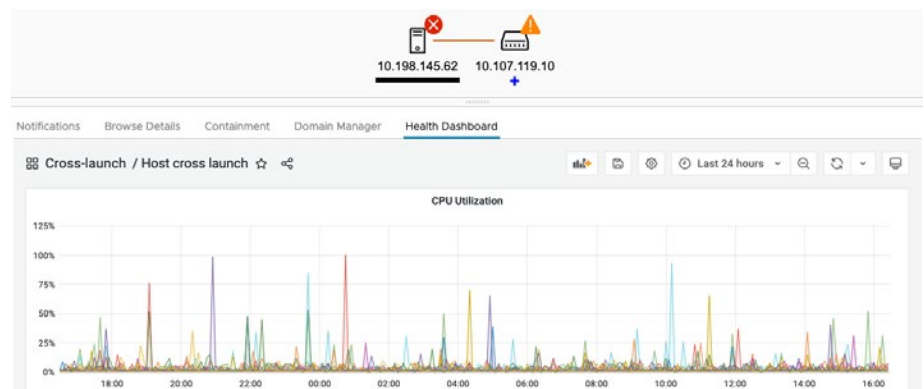


Figure 4: Fault management and performance management with root cause analysis.

Features (continued)

Data collection framework

- Ingest and contextualize network metric data to provide up-to-date view of network service and network infrastructure
- Support rapid onboarding and visualization of EMS/NMS or device, CNF metrics from hours/days
- Self-serve, UI-based onboarding by customer, partner or system integrator
- Integrated with VMware vRealize® operations

Automated root cause and service impact analysis

VMware Telco Cloud Service Assurance’s root cause and service impact analysis capabilities provide fast problem resolution by automatically correlating symptoms from the many layers of the infrastructure stack (physical, virtual, Kubernetes, CNFs, VNFs and services) and pinpointing the problem’s root cause.

	Severity	Acknowledged	Owner	Class Name	Name	EventName	Event State
<input type="checkbox"/>	Critical	false		Host	10.198.145.62	Down	ACTIVE
<input type="checkbox"/>	Major	true	SYSTEM	CPU_Performanc...	PSR-10.198.145.62/69 [CPU Pkg/ID/...	HighUtilization	INACTIVE
<input type="checkbox"/>	Major	true	SYSTEM	CPU_Performanc...	PSR-10.198.145.62/80 [CPU Pkg/ID/...	HighUtilization	INACTIVE
<input type="checkbox"/>	Minor	false		Host	10.198.145.62	UnresponsiveInRemote	ACTIVE
<input type="checkbox"/>	Unknown	false		Host	10.198.145.62	Unresponsive	ACTIVE

Figure 5: Automated Root Cause Analysis.

With VMware Telco Cloud Service Assurance, CSPs see at a glance the problems that require priority remediation. Instead of presenting the user with thousands of separate symptom alarms and alerts from a plethora of tools, VMware Telco Cloud Service Assurance correlates all the active, inactive and unknown alarms together with the network topology to rapidly identify the problem’s root cause.

The solution then bridges the gap between operations and customer care by automatically translating infrastructure failures into the customer-impacting service impacts. It does this by identifying the technology and business objects affected by each problem and then analyzing value of the failure’s impact on the service and customer, as shown below. It also issues notifications and triggers actions.

By putting infrastructure problems in a business context, CSPs can prioritize their responses in real time according to the business impact, such as tenants who have contracted higher-value services and SLAs.

Closed-loop automation and remediation

Meeting SLA and service quality expectations in real time requires automated remediation across the infrastructure, orchestration and service layers when faults occur. VMware Telco Cloud Service Assurance provides a remediation policy framework that automates the processes and procedures for common NOC faults that can be handled without human involvement.

Administrators can define policies to allow automatic remediation actions when specific infrastructure faults occur that affect service. Different automated remediation actions can be taken based upon the duration of the problem. The framework also manages the remediation process by providing alerts and notifications, dispatch for repair, etc.

Business impact analysis results then drive closed-loop remediation through integration with resource, service and lifecycle management orchestrators that are based on SOL API standards, such as VMware Telco Cloud Automation. VMware Telco Cloud Service Assurance drives closed-loop actions for infrastructure lifecycle management by making recommendations to orchestrators based on identified root cause issues, such as a need to allocate more vCPUs on a specific video to handle increasing traffic.

VMware Telco Cloud Service Assurance combines automated discovery and topology mapping across physical, virtual and container environments to provide complete visibility, along with cross-domain root cause analysis and service impact determinations to understand the impact of failures on services and customers. Through automated closed-loop actions, 5G service quality is maintained and delivered consistently.

VMware Telco Cloud Service Assurance 5G use cases

CSPs can address many use cases with the VMware Telco Cloud Service Assurance platform, such as:

- **5G RAN/core assurance**—Both CNFs and VNFs are automatically discovered. They are shown graphically in the network topology map, including how they are linked to the subscriber's services. When CNFs or VNFs are impacted by failures or exhibit performance degradation, operators are notified. With actionable insights and root cause analysis, operators can immediately respond and remediate the root cause.
- **CaaS, NFVI and xNF assurance**—VMware Telco Cloud Service Assurance communicates with Kubernetes to extend self-healing and remediation of the underlying root cause when it happens below the CaaS layer, in the VIM layer or virtual or containerized network functions in multi-cloud environments
- **Virtual EPC assurance**—VMware Telco Cloud Service Assurance dynamically models vEPCs, performance KPIs and connectivity through the infrastructure. Analytics enable operators to identify trends and correlate root cause. VMware Telco Cloud Service Assurance can also automatically invoke orchestrators for remediation or to provide necessary resources.

Learn more

To learn more, please visit our VMware Telco Cloud website at telco.vmware.com, or call 1-877-4-VMWARE (outside North America, dial +1-650-427-5000).

- **IP assurance**—VMware Telco Cloud Service Assurance automates root cause analysis, correlation to upper layers of the infrastructure (e.g., the CaaS layer) and auto-remediation of virtual and physical network elements.
- **Transport backhaul network assurance**—VMware Telco Cloud Service Assurance monitors complex L2, L3 networks and automatically determines causality of the physical and virtual network infrastructure and the end-to-end connectivity. Remediation is achieved by invoking EMS, SDN controllers or by running predefined scripts for the use case in question.

VMware Telco Cloud Service Assurance: Comprehensive service assurance for 5G

VMware Telco Cloud Service Assurance provides the best of virtualization and cloud technologies plus service monitoring excellence on a cloud-native platform. It simplifies the complexity of 5G by providing CSPs the operational intelligence and use cases they need to manage their wide-ranging multi-vendor virtual, physical and service layers—all in a single tool that acts as a manager of managers.

The platform provides end-to-end monitoring of a rich set of vendor products and solutions across vertical tiers from physical to CaaS to application, as well as horizontal domains from fixed line to transport to core, RAN and edge. Fully integrated discovery and topology, automated alarm reduction and automated root cause analysis are performed across the entire infrastructure and all layers.



Simplify complexity
End-to-end, multivendor
5G environment



**High QoE &
Improved SLA**
RCA and impact analysis



Reduce OpEx
Closed-loop automation
and remediation

VMware Telco Cloud Service Assurance provides high levels of service quality with its automated, model-based root cause analysis and business impact analysis that enable proactive assurance. Problems can be resolved manually by NOCs and SOCs or automatically via closed-loop actions and remediation.

The platform's powerful capabilities improve efficiency and reduce operating costs. Service quality is improved with intelligent analytics and automated operations and remediation that are prioritized based on customer and service business impacts.

VMware is an established service assurance company that is vendor-agnostic and application-agnostic, with a wide range of technology partners.