Hewlett Packard Enterprise

Technical white paper

HPE Composable Fabric for VMware environments

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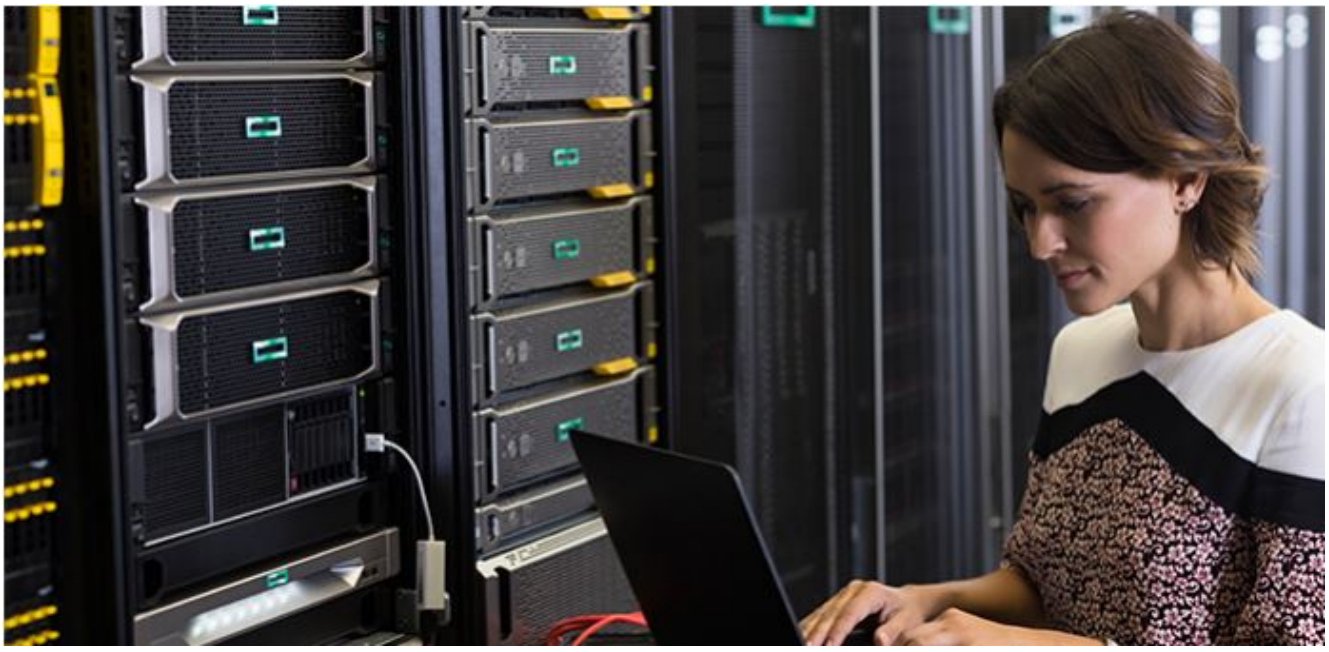

The HPE Composable Fabric integration with VMware® helps the software-defined data center (SDDC) to tightly assimilate the VMware tools with the hardware, software, and automation that HPE Composable Fabric provides. This integration creates a first-class user experience for composable cloud network and data center administrators, where all their high-level workflows for configuration, provisioning, and automation are provided through native VMware tools.

Out of the box, HPE Composable Fabric offers many key capabilities to enable a highly agile data center network. It offers customers prebuilt, fully tested integrations for both VMware vSphere® and VMware NSX® Manager™ that enable administrators to automate everyday network operations, as well as dramatically improves visibility into network and host configuration details. HPE Composable Fabric networks can be managed directly from the vSphere management interface, simplifying administration and troubleshooting. In addition, HPE Composable Fabric integrates the network's physical datapath and control paths with the VMware NSX® network virtualization layer to create a truly synchronous physical and virtual network experience.

Integration benefits

- Simple and straightforward
- Reduces complexity, operating costs, and time-to-value for VMware deployments with fully automated network configuration
- Segments the network dynamically to provide mission-critical reliability and performance for specific workloads
- Creates user-driven workload service-level agreement (SLA) policies to ensure workload path priority and security
- Supports multiple workload classes, including isolated IP storage, to reduce network capital and operational costs with single-network fabric
- Allows users to add more capacity with single-tier fabric topology by connecting more rack connectivity modules
- Scales nondisruptively from single-rack deployments to cloud-scale deployments with equal ease

HPE Composable Fabric integration with VMware

The seamless integration of HPE Composable Fabric with VMware is achieved through the HPE Composable Fabric Manager and associated VMware integrations, which contain specific logic and interfaces to VMware. This prepackaged, pretested, and fully supported VMware integration enables HPE Composable Fabric to automatically discover managed elements (such as physical nodes, virtual machines [VMs], virtual LANs [VLANs], link aggregation group [LAGs], and VMkernel adapters) in the VMware environment. It also provides workflows to automate operations such as dynamic network provisioning for VM lifecycle events and storage path optimization—all managed through vSphere.

The VMware integrations enable HPE Composable Fabric to automatically discover VMware nodes and dynamically reprovision the network fabric in response to VMware compute and storage events. This action enables high network performance and service quality for diverse applications and workloads, while making optimal use of network capacity.

HPE Composable Fabric enables VMware customers with the fundamental key benefits of automation and network path control across the following three main functional areas:

- Configuration
- Operations and management
- Network virtualization via NSX

The VMware integration and automation capabilities translate directly into significantly reduced complexity, lower operational costs, and fast time-to-value for VMware customers.

Network configuration—dynamic, auto-configured VMware fabric

HPE Composable Fabric provides out-of-the-box automation to reduce configuration time and improve solution time-to-value. This integration eliminates the guesswork of overprovisioning network capacity at initial network configuration and enables customers to ensure network performance and security for a given workload via workload path isolation.

Auto-configuration

HPE Composable Fabric automatically collects important network, port, and grouping information from VMware, synchronizing the host and physical network infrastructures. Empowering VMware administrators through network automation to avoiding manual infrastructure build-outs. As a result, the following components are then enabled with auto-configuration capabilities:

- VLANs
- LAGs
- Dynamic vMotion network migration
- Isolated VMware vSAN™ network topology

Logical workload policies

The creation of new workloads is one of the most basic aspects of running a data center. These workloads need physical resources on to execute compute and storage. They also need network connectivity between those components, as well as other workloads.

Data center administrators leverage VMware tools to deploy these workloads and define the various virtual machines, storage LUNs, vSANs, VVols, and other virtualized abstractions of the physical resources. They also need to define how these components are interconnected. The integration of HPE Composable Fabric with VMware vCenter® enables this interconnection and related policies to easily synchronize automatically, without user intervention.

Dynamic affinity groups for VMware data services

The network integration with VMware makes HPE Composable Fabric's centralized control software aware of the specific VMware environment, including VMware data services, storage arrays, and end-user applications. This awareness enables the HPE Composable Fabric's centralized control software to understand the nature of various application workloads, their endpoint participants (affinities), and their relative importance and priority. With this knowledge, VMware administrators can configure (dynamically or explicitly) unique paths through the network fabric that are aligned to the needs of each workload. As workloads are added, changed, or deleted, the fabric continuously adjusts to match their new demands.

HPE Composable Fabric provides the following capabilities in support of VMware data services:

- **vMotion:** HPE Composable Fabric detects and visualizes vMotion events and provides improved path resources via preallocated bandwidth preventing the vMotion event from impacting other user traffic and ensuring a high-quality, speedy migration.
- **Fault tolerance (FT):** VM FT is used to create highly resilient VMs and includes VM-to-VM state information that is synchronized. HPE Composable Fabric can be configured to optimize this configuration, creating an isolated network for these critical VMs to ensure their state synchronization is congestion free.
- **vSAN:** HPE Composable Fabric and VMware integration automatically discovers VMkernel adapters that participate in vSAN environments and creates an isolated topology that is dedicated to carrying vSAN storage workloads. Storage typically creates a noisy neighbor problem when integrated onto a common network, which is why many people create separate dedicated networks for storage traffic, which creates unneeded cost and complexity. In contrast, HPE Composable Fabric provides a single network fabric that is logically separated and controlled through HPE Composable Fabric Manager.
- **Integrated in-band management:** Management in a VMware environment typically requires a separate out-of-band network. While this is generally a good practice, it can also create a separate operational domain. HPE Composable Fabric can integrate the VMware management into a logically separate part of the network fabric to ensure containment.

Dynamic affinity groups for VMware lifecycle events

HPE Composable Fabric enables administrators to manage VMware lifecycle events on a per-workload basis. For example, in many environments, especially those leveraging virtual desktops, many VMs will boot at the same time causing boot storms. HPE Composable Fabric offers the programmatic ability to define a threshold that indicates that a boot storm is in progress which allows to sets up an affinity grouping to ensure the VM boots don't create congestion that could slow the booting process.

Network configuration summary

HPE Composable Fabric for VMware allows a customer to easily create a network for VMware ESX® environments. From a configuration perspective, the integration is aimed at solving basic auto-configuration capabilities, as well as more advanced capabilities that help improve policy automation for workload performance and automatic network services that apply to the VMware infrastructure. Overall, the network configuration phase creates an easy-to-use network that has out-of-the-box automation to save time and facilitates optimum workload performance with a fabric that is already aware of critical VMware infrastructure services.

Management and operations

Network administration has traditionally been a labor-intensive and time-consuming effort. In modern cloud-centric data centers that leverage virtualization, there are many advanced software tools that provide visibility and correlation of the physical infrastructure to workload-related issues and problems. HPE Composable Fabric with VMware vSphere allows customers to further benefit from native VMware tools because Composable Fabric can provide highly relevant details to the VMware dashboard. This integration simplifies the day-to-day operations of the data center and makes troubleshooting across the physical and virtual environments easier, allowing the VMware administrator to view everyday operational tasks from a single dashboard.

Per-workload path control

Traditional leaf-and-spine network approaches distribute workload traffic using the Equal-Cost Multipath (ECMP) algorithm, which attempts to distribute workload traffic evenly across all available links by randomly choosing paths and limiting the network's flexibility to optimize performance across workloads. Because this traditional approach is unaware of specific workloads, its random selection of network paths typically leads to network hotspots and congestion that is difficult to diagnose and remediate.

With HPE Composable Fabric, administrators can provision network paths according to the specific needs of any given workload. HPE Composable Fabric Manager is aware of application and infrastructure workloads through its integration with higher-level orchestration and infrastructure management tools, such as VMware vCenter providing a multitude of granular paths across the fabric. HPE Composable Fabric Manager leverages this awareness to provide each workload with the right set of paths to satisfy the workload's individual needs for network capacity.

HPE Composable Fabric's ability to granularly manage paths on a per-workload basis enables the fabric to meet workload performance needs and avoid workload congestion even as the environment scales to meet increasing CPU and storage workloads. As the network needs grow, new switches can be added completely incrementally without disruption to the running environment.

Fully integrated visualization

HPE Composable Fabric workload visualization tools display where and how traffic is being distributed across the network fabric, on a per-workload basis, helping IT administrators monitor system performance and resource utilization in real-time. Through the HPE Composable Fabric integration with VMware vSphere, administrators can view the fabric and other environment statistics directly from vSphere, enabling the administrator to manage their entire VMware environment, including the network, from a single known portal.

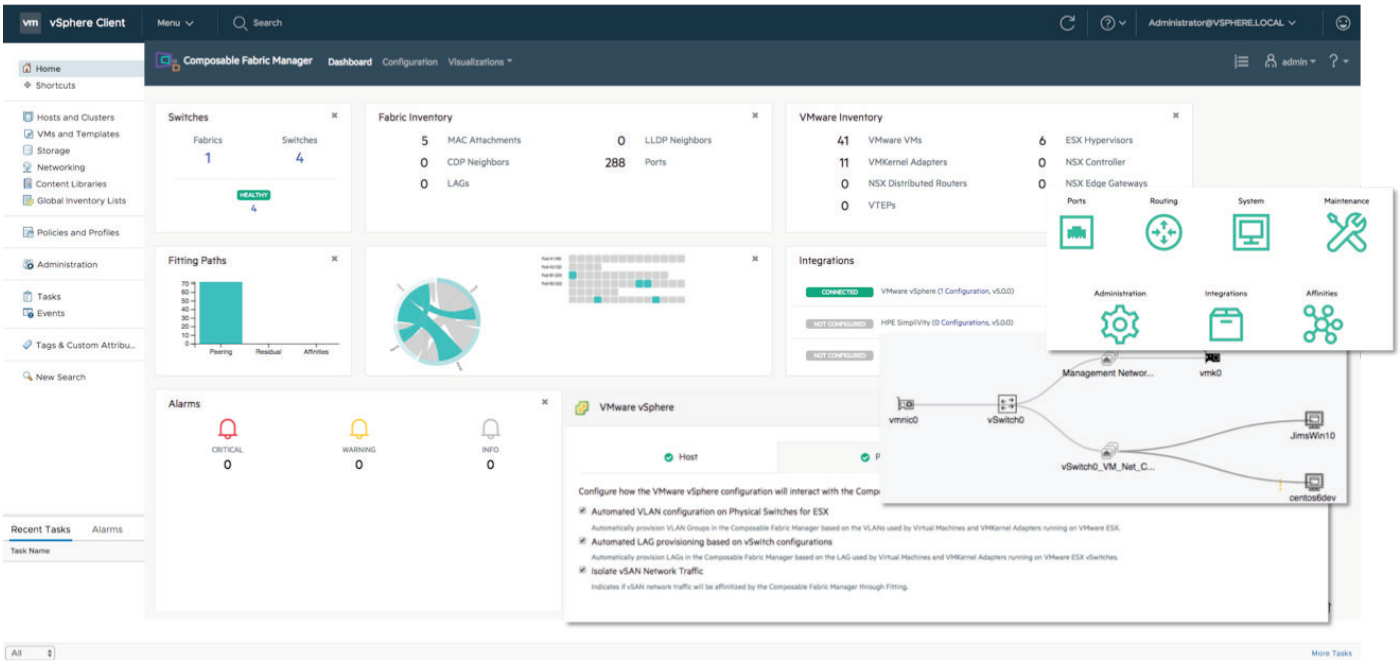

Figure 1. HPE Composable Fabric Manager dashboard view from within vSphere

Management and operations summary

Network operations have historically been a time-consuming and labor-intensive effort. In modern cloud-centric data centers that leverage virtualization, there are many advanced software tools that provide visibility and correlation of the physical infrastructure to workload-related issues and problems. HPE Composable Fabric with vSphere allows customers to further benefit from those tools because the fabric can provide highly relevant details to the VMware dashboards. This simplifies the day-to-day operations of the data center, troubleshooting across the physical and virtual environments becomes easier, and everyday operational tasks can be viewed from a single dashboard.

Native network virtualization with VMware NSX and HPE Composable Fabric

VMware NSX is a popular network virtualization solution. Network virtualization allows customers to define their networking constructs in software such as virtual switches that operate on the host devices themselves (within the hypervisor). The NSX software creates virtual networks that define specific connectivity between groupings of devices.

When NSX runs on a traditional physical network, it runs as an overlay, which means there is little to no coordination between the virtual and physical network—the latter is treated as a pure transport layer. This separation of the physical and virtual network requires significant manual engineering effort and forethought to ensure the physical network meets the needs of the virtual layer. When the physical network is reduced to transport only, it loses the visibility and awareness of the traffic, rendering it unable to react to congestion issues or other problems.

When NSX runs on an HPE Composable Fabric infrastructure, the physical network and the virtual network can be natively and dynamically aligned providing unified visibility, traffic awareness, and traffic path optimization.

Tight virtual-to-physical integration

With HPE Composable Fabric, tight virtual-to-physical integration is called overlay awareness, which includes the following key capabilities:

- Interface with the VMware NSX Manager to discover NSX components, including VXLAN network identifiers (VNIs), VXLAN tunnel endpoints (VTEPs), VMware NSX® Edge™ services, VMkernel adapters, and VM IPs/MACs
- Visualize the components in the UI and make them available for debug, search, and more
- Create affinity groups based on detected NSX traffic for these components to automate workload path provisioning and isolation
- Create domain affinities that allow all endpoint members of a specified domain to receive the same treatment without specifying each endpoint individually; for example, this capability is useful for designating all VTEPS, a specified set of VNIs or traffic to/from the NSX Edge
- Track the movement and expansion of ports, VLANs, and LAGs

These capabilities not only allow the physical and the virtual network to appear as a single network to the user but also offer debugging and troubleshooting at each layer with the relevant information correlated between layers. In contrast to separate and disjointed over/underlay solutions, this type of native virtualization creates a more cohesive network infrastructure and drastically reduces provisioning times and mean time to repair.

Organizations building clouds based on VMware's market-leading technology need a flexible and agile infrastructure, which they can achieve with a fully integrated network like HPE Composable Fabric that leverages and enhances the agility of VMware. HPE Composable Fabric without NSX integration delivers an easy-to-scale-out network fabric that organizations can fully operationalize from the VMware Cloud™ management tool. When adding NSX integration, the native network virtualization preserves the agility expected by the user, down to the physical network and creates a simplified engineering and architecture experience that saves time, money, and reduces errors to create a fully optimized network.

Summary

The seamless integration of HPE Composable Fabric with VMware enables VMware administrators to manage their VMware-centric infrastructure using native vCenter. HPE Composable Fabric also supports VMware NSX virtual network overlay providing synchronization with our awareness and automation of the VMware infrastructure.

HPE Composable Fabric for VMware enables customers running VMware infrastructure to significantly reduce management complexity and operational costs, and provides an easily scalable platform for non-disruptive, incremental network growth. With HPE Composable Fabric, organizations become more flexible and agile to react more quickly to changes in the business and IT infrastructure. And with the awareness of the VMware environment, many management tasks become automated, freeing staff resources to focus on other facets of IT. HPE Composable Fabric is simple, cost-effective, and synergistic with VMware infrastructure and tools.

Learn more at
hpe.com/composable/fabric

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