

Converged Cloud Fabric - Underlay automation for VMware Cloud Foundation

Document Version 1.0

Introduction

Organizations are constantly striving to simplify their operational environment to support dynamic business priorities. As they embark on this journey of digital transformation to modernize their data centers, they are rapidly embracing cloud-style principles like self-service operations, agility, scale-out architecture, resiliency and unified management to name a few.

By leveraging VMware Software-Defined Data Center (SDDC) technologies, organizations are able to drive agility and cost efficiencies for their application workloads. This holistic software-defined approach encompasses automated application deployment across both physical and virtual infrastructure.

VMware Cloud Foundation is an integrated software stack that bundles and automates deployment of compute (vSphere), storage (vSAN) and network virtualization (NSX) components. Admins no longer have to worry about making sure they are using the compatible versions on each of these products, or going through the deployment documents for each of the products, thus simplifying the SDDC deployment and have the environment ready in a few hours.

Legacy underlay networks, however, still prove to be a bottleneck as they have been traditionally challenging for data center administrators to design and configure. It is imperative to provide cloud-style agility, experience and operational simplicity for underlay networks as well Network needs to be able to provide seamless Day0/Day1/Day2 operations in a heterogeneous application environment with the flexibility of deploying any virtualization, container and Hyper-Converged Infrastructures (HCI).

Automation across physical and virtual networks therefore becomes a critical aspect of the SDDC-automated infrastructure. In addition, gaining visibility across physical and virtual networks is becoming paramount for network and VMware administrators, as troubleshooting has been challenging with traditional networks.

Solution

Arista Converged Cloud Fabric (CCF) approach simplifies data center networking by providing operational consistency, visibility and governance. The platform embraces the same design principles adopted by public cloud providers to offer a fully cloud-like experience for on- premise data centers. Arista CCF empowers organizations to transform and future-proof their networks for a hybrid, multi-cloud world and meet the scale and performance requirements of the new digital economy.

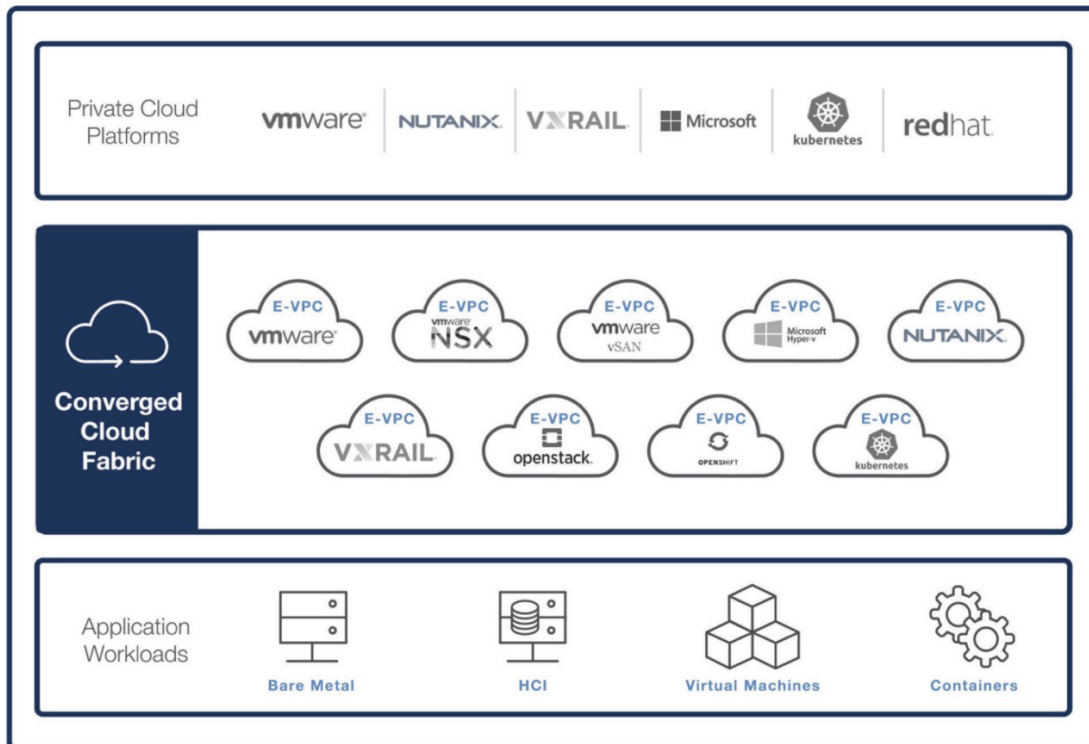


Figure 1: E-VPs on CCF

The CCF controller operates as “one logical switch”, which removes complexity and automates Day0/Day1/Day2 operations, delivers Network-as-a-Service through cloud-style Enterprise Virtual Private Cloud (E-VPC), and provides contextual analytics for deep visibility.

In this document, we will talk about why Converged Cloud Fabric (CCF) is an ideal underlay fabric for VMware Cloud Foundation (VCF) driven software-defined data center (SDDC). If you are an admin looking to deploy VMware Cloud Foundation, this document will provide useful insights in how Converged Cloud Fabric uncomplicates underlay operations for maximizing benefits from your VCF deployment.

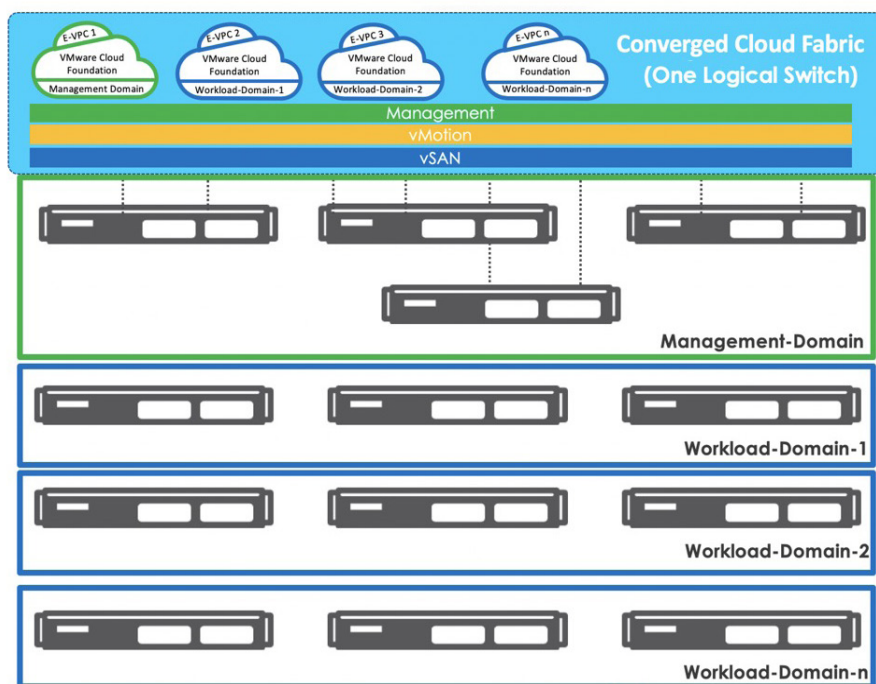


Figure 2: CCF and VMware Cloud Foundation integration

Legacy Box-by-box Network Challenges when deploying VMware Cloud Foundation

Let's take a look at why choosing the right underlay is critical for maximizing your VMware Cloud Foundation deployment experience. The SDDC components (vSphere, vSAN and NSX) get deployed on multiple different ESXi nodes. These nodes need to communicate with each other for Management, vSAN and vMotion traffic. This connectivity is provided by the underlay network in the form of VLANs

If you are choosing a typical legacy box-by-box underlay network for VMware Cloud Foundation then here is what needs to happen before one can start with the VMware Cloud Foundation deployment.

1. **Box-by-Box provisioning complexity:** The underlay switches need to be manually deployed by loading the correct software version which is tested and qualified and then with appropriate configuration on a switch-by-switch basis. This underlay provisioning could take weeks to months starting from unboxing switches to successfully adding ESXi nodes for VCF deployment.
2. **Host Network Provisioning:** The ESXi nodes need to be connected to the physical box-by-box network, and appropriate VDS configuration along with TOR switches need to be configured manually with appropriate configurations for LAGs/LACP, etc. Single rack may include 20-40 ESXi hosts implying 100+ endpoint configuration to get all hosts working in a rack. A lot of these touch points have significant room for errors and takes a long time to make it operational.

3. **Infrastructure VLAN provisioning:** VCF infrastructure VLANs for Management, vMotion and vSAN need to be manually provisioned on each TOR switch to establish the connectivity required for the deployment to succeed. Depending on your network architecture, overlay network provisioning might be required, which can further complicate the deployment process. Once VLANs are provisioned, the deployment of VMware Cloud Foundation (Management Domain and SDDC manager) can be initiated.
4. **Workload Domains:** As additional workload domains get deployed on VMware Cloud Foundation, network admins need to repeat all the above steps. This additional dependency adds delay in application / service on-boarding.

The above process with the legacy networking, is cumbersome and error prone process and can significantly prolong the VMware Cloud Foundation deployment

Deploying VMware Cloud Foundation on CCF

Let's see in detail how CCF can expedite the VMware Cloud Foundation deployment by simplifying each of the above mentioned deployment steps. Underlay is fully abstracted and made logical, presented as a service, so that there is no hard dependency on the physical network constructs and/or topology.

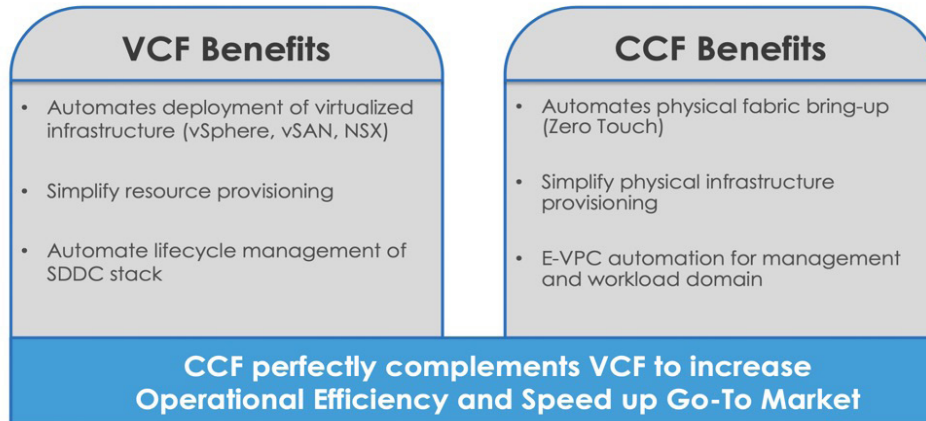


Figure 3: CCF and VCF benefits

Essentially CCF underlay becomes "invisible" to SDDC, thus enabling the underlay to operate at the speed of VCF.

Underlay provisioning

CCF provides Zero-Touch Fabric operations, once physical cabling is in place, the underlay provisioning is completely automated. No cumbersome, error-prone process like the legacy box-by-box approach.

The switches in the fabric are auto-discovered and auto-provisioned to form a leaf/spine fabric with the right operating system. Network admins need not worry about switch software versions or initial configurations. This is also applicable if switches need to be RMA'ed in the future, all that the data center installation admin has to do is to remove the old switch and replace it with the new switch. They don't even need to plug in cables in the same ports.

Automated fabric-wide software upgrades make future upgrades seamless. Network admins no longer need to worry about moving workloads around, writing complicated traffic draining policies or scheduling long maintenance windows for the upgrade.

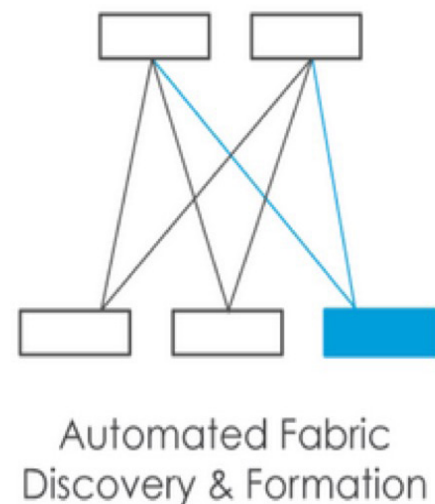


Figure 4: CCF Zero-touch Fabric formation

Host Network provisioning

As soon as the ESXi nodes are physically connected to CCF, they get auto discovered and provisioned. In other words, no need to manually configure the switch and interface where the host connects, thus simplifying **Host Network provisioning**. No hard-wired port mapping needed -- a server link can be connected to any speed-appropriate switch port. CCF automatically re-provisions for the new port. Also any server can be placed in or moved to any rack at any time -- CCF controller does the heavy lifting of automatic logical-to-physical mapping through SDN intelligence while providing full topology visibility to the network admin.

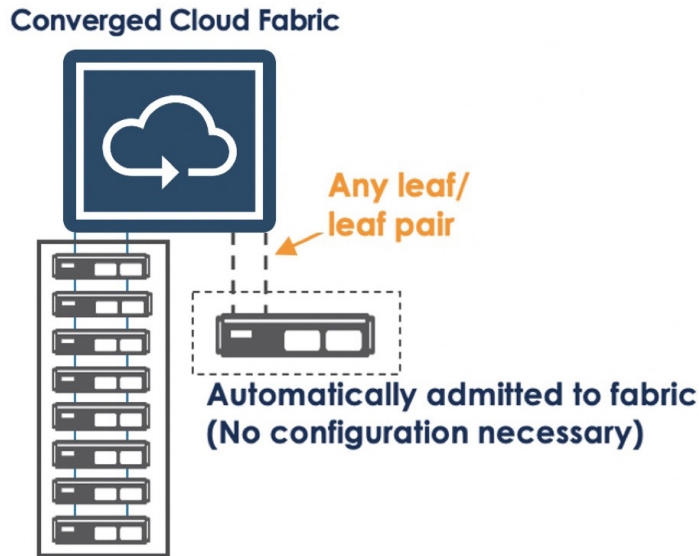


Figure 5: CCF Host Automation

VLAN provisioning

Just like the Public Clouds use the VPCs to build multi-tenant L2/L3 networks, CCF leverages AWS-style virtual private cloud (VPC) on-prem construct to deliver Cloud-Network-as-a-Service operational experience. Specifically, CCF creates Enterprise VPCs (E-VPC) on-prem for each of your VMware SDDC components allowing logical L2/L3 isolation and multi-tenancy.

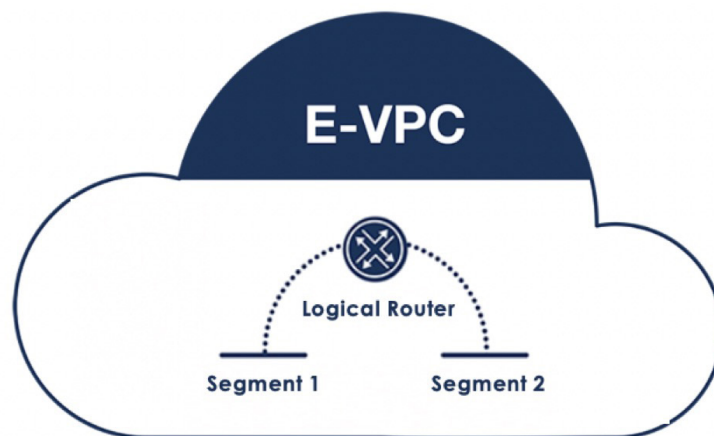


Figure 6: CCF E-VPC

CCF automates **L2 network provisioning** (e.g. VLANs) within the E-VPCs so admins need not configure the VLANs manually box-by-box as we saw with the legacy approach. Even when a host is moved from one rack to another, no network provisioning is required.

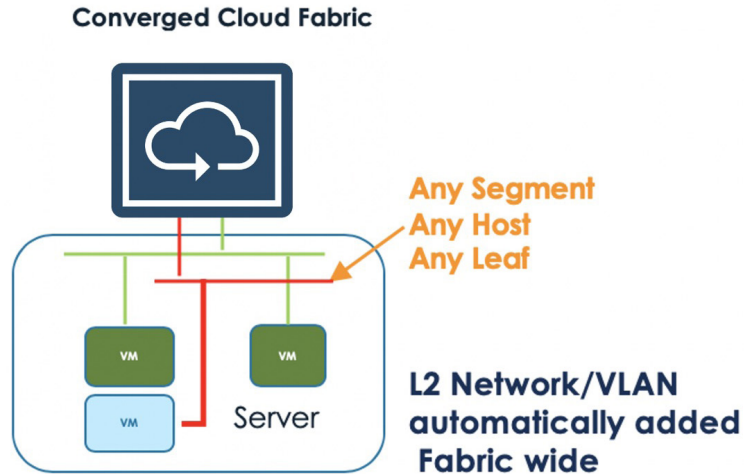


Figure 7: CCF VLAN Automation

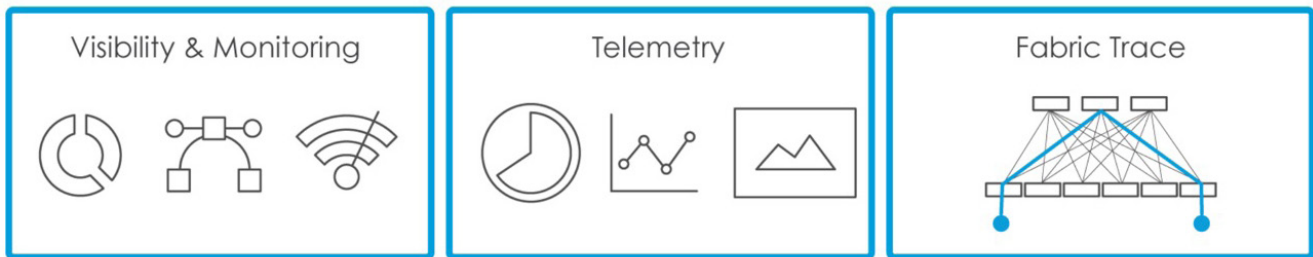
Workload Domains

As admins deploy **Workload Domains** on VMware Cloud Foundation, E-VPCs are created for each workload domain.



Figure 8: CCF E-VPC support for VMware SDDC suite

As an example, in your VMware Cloud Foundation deployment, vCenter for each workload domain gets their own E-VPC allowing multi-tenancy and delegated administration.



Additionally, with E-VPC’s contextual Visibility and Fabric Analytics, admins get deep insights into vCenter or NSX networking right from CCF dashboard. With CCF’s one-click troubleshooting capabilities, the end-to-end (fabric-wide) path tracing of the packet quickly resolves the “Is it App or the Network” conundrum, without having to perform tedious, time consuming box-by-box hopping.

Summary

CCF, with its Zero-Touch Fabric capabilities and E-VPC automation, makes the network fast and simple -- essentially invisible. Additionally, CCF provides tremendous visibility and troubleshooting capability to help network and virtual admins. It perfectly complements VMware Cloud Foundation, by delivering an ideal underlay for all VMware Cloud Foundation deployments.

		vSphere	NSX	vSAN
Automation	Host Automation	Y	Y	Y
	VLAN Configuration Automation	Y	Y	Y
Visibility and Troubleshooting	Visibility	Y	Y	Y
	One Click Troubleshooting	Y	Y	Y
	Fabric Analytics	Y	Y	Y

Figure 9: CCF Integration for VMware SDDC suite

Technical Resources

Converged Cloud Fabric: <https://www.arista.com/en/products/converged-cloud-fabric>

Hands on labs: <http://ccf-labs.arista.com>

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