

Converged Cloud Fabric & Microsoft Hyper-V

Network Automation and Analytics with Self-Service Enterprise VPC

Converged Cloud Fabric (CCF) for Microsoft Hyper-V brings cloud-style self-service experience and zero-touch SDN-based infrastructure, so that on-prem data center networks operate at the speed of the VMs. CCF's game changing integration with Microsoft Virtual Machine Manager (VMM) automates physical networking and provides contextual analytics for Hyper-V virtualized environments.

Converged Cloud Fabric for MSFT Hyper-V Solution Benefits at-a-glance

Fabric Automation and Visibility for Hyper-V including:

- Auto-host detection via Microsoft LLDP agent on the node
- E-VPC automation for self-service physical network
- Auto network policy migration
- VM-level visibility (VM MAC and VM IP address)
- VM-to-VM troubleshooting (Logical & Physical)

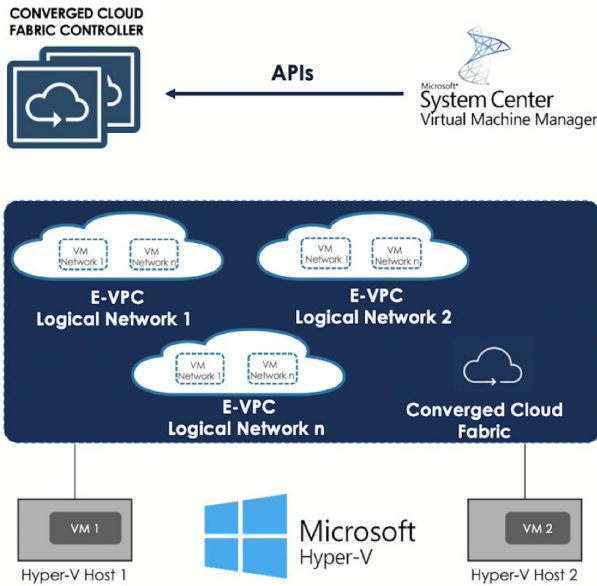
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The IT Challenge

Organizations are constantly striving to simplify their operational environment to support dynamic business priorities while enabling innovative services to further differentiate. Many organizations have adopted Microsoft's Hyper-V for their enterprise cloud and virtualization needs to drive agility and cost efficiencies. Physical networking, however, has traditionally been challenging for data center administrators to configure and manage due to the insurmountable complexity of traditional box-by-box network design. A cloud-style data center encompassing automated application deployment across both physical and virtual infrastructure is very essential for digital enterprises and IT transformation. This demands a cloud-style physical network that is self-service, delivering network automation, zero-touch operations and contextual analytics, to enable IT infrastructure that is agile, flexible and cost optimized. Gaining visibility across physical and virtual networks is also paramount for network and virtualization administrators, as troubleshooting has been extremely cumbersome and time consuming with traditional box-based networks.

Arista Solution

Arista Networks Converged Cloud Fabric (CCF) is an ideal cloud-style fabric to automate Microsoft Hyper-V virtualized environment. CCF's (self-service) automated fabric architecture leverages Cloud networking design principles, and is delivered on industry-standard merchant silicon switches. CCF supports the Microsoft VMM server virtualization environment to provide network connectivity for Hyper-V VMs and hosts. CCF leverages Azure-style VNet constructs on-prem (called Enterprise Virtual Private Cloud or E-VPC) to deliver a Network-as-a-Service (NaaS) operational model. CCF automates networking for Microsoft Hyper-V platform, enabling the network to operate at the speed of VMs. The CCF Controller acts as a single pane of glass for fabric configuration and integrates with the VMM for physical network automation. With built-in analytics and telemetry, CCF provides real-time contextual visibility across the fabric and one-click troubleshooting workflows. NetOps, DevOps and CloudOps teams can now effectively collaborate, and rapidly on-board applications and tenants.



Day1/Day2 Operations	CCF
Auto-Host Detection, Auto MLAG	0-Click
Auto Network Configuration (E-VPN)	0-Click
Contextual Visibility (VM/Host Context)	0-Click
VM-to-VM/Container-to-Container Troubleshooting	1-Click
Contextual Analytics (Fabric + Workload)	0-Click

Figure 1: CCF integration with Microsoft VMM and Hyper-V

The Solution Components

Microsoft VMM & Hyper-V

Microsoft VMM Server provides a centralized and extensible platform for managing virtual infrastructure. It manages Hyper-V environments, giving IT administrators simple and automated control over the virtual environment. It ensures security and availability, and reduces the complexity of managing virtual infrastructure. A single administrator can manage hundreds of physical hosts and thousands of VMs, more than doubling typical productivity when managing traditional physical server infrastructure.

Converged Cloud Fabric

CCF is an automated SDN fabric, delivering cloud-style self-service VPCs and integration with Microsoft Hyper-V to simplify networking across on-premise enterprise cloud deployments:

- **CCF Experience:** Customers can modernize their data center networks by using cloud-style VPCs on-prem, called Enterprise VPC (E-VPN). Additionally they gain cloud-style agility and NaaS by leveraging E-VPN automation so that the network operates at the speed of VMs.
- **CCF Operations:** Customers can improve their deployment and troubleshooting operations by using CCF Zero-Touch workflows and Contextual Analytics.
- **CCF Infrastructure:** Customers get high performance merchant silicon hardware, with fully aggregated SW+HW from a single vendor and single call for technical support.

Additionally CCF solution ensures network resiliency at scale when deployed with high-availability (HA) best practice design.

Customers are deploying CCF in existing data centers on a pod-by-pod basis. CCF supports multiple use cases, including server virtualization with Microsoft Hyper-V, Big Data analytics, private cloud, virtual desktop infra (VDI) and multiple VMM-based VPCs.

VMM Clusters

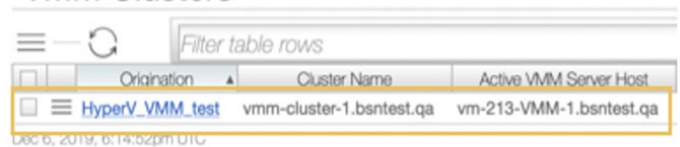


Figure 2: Hyper-V VMM cluster Auto-detected

CCF Network Automation for Hyper-V

The CCF/Hyper-V solution streamlines application deployment workflows by automating the physical network configuration for Microsoft virtual workloads. The CCF controller acts as a single point of integration with VMM. It gets notified of events from the VMM, upon which it performs the corresponding fabric operations and eliminates the need for any manual configuration of the physical network. The solution offers the following capabilities that simplify network operations in Microsoft environments.

Automatic Hyper-V Host Detection & Auto-MLAG Configuration

Hyper-V hosts connected to CCF are automatically discovered by the CCF Controller. The CCF Controller then automatically creates link aggregation groups (LAGs) with the leaf switches making this a zero-touch operation. The operational savings due to this automation are tremendous when there are hundreds of servers connected to the fabric. No manual network team intervention required, but the network team has complete visibility in real-time to the changes occurring in the compute environment. Essentially, the network operates at the speed of compute.

Interface Groups (MLAG)

Name	Leaf Group	State
hyperv-44.bsntest.qa_64802114-3db0-497b-b929-ee...	leaf0	Up
hyperv-45.bsntest.qa_64802114-3db0-497b-b929-ee...	leaf1	Up

Figure 3: Hyper-V Hosts Auto-detected and Host MLAGs Auto-created

E-VPN Automation for Physical Network Configuration & Self-service Operations

As part of the application deployment process, VMM creates, modifies or deletes Logical Networks to enable Hyper-V VM-to-VM communication. In CCF, a dedicated E-VPN is created for each Logical Network in VMM. CCF Controller gets notified of these events and automatically creates, modifies or deletes the corresponding CCF E-VPNs, L2 segments (e.g. VLANs) and segment membership. Additionally, as new VMs are created in VMM, they are automatically learned in the fabric as an endpoint, and network policies are auto-migrated upon VMs migrating to different Hyper-V hosts. E-VPNs hence allows the network team to deliver self-service experience to Hyper-V application team. Network operates at the speed of Hyper-V VMs.

EVPC-Tenants

Name	Display Name	Description
9a11aba5-5be6-40d0-9b06-0aa2e...	BCF_LN1_VLAN100to200	Logical Network 1

Figure 4: E-VPN for Hyper-V Auto-created

Network Policy Migration with Live Migration on Windows Server

Live Migration is a powerful capability to seamlessly move VMs from one Windows Server to another. When a Live Migration is initiated in VMM, the CCF Controller gets notified of the new location (host) of the VM and migrates the network policies dynamically.

Simplified Visibility & Troubleshooting

The key challenge with networking is the lack of visibility regarding end-to-end connectivity between VM endpoints. The CCF for Hyper-V solution offers significant benefits to network administrators by providing advanced end-to-end fabric tracing, policy tracing and enhanced one-click troubleshooting capabilities, all managed through a single pane of the glass, the CCF GUI. Network team can more effectively collaborate with Hyper-V team, rapidly resolve “app or the network” issues and granularly identify any networking related issues.

VM Networks

Name	ID	VLAN	Subnet	EVPC-Tenant	Logical Network Name
VM_Network_100	206a5345-e440-4080-8335-70704435e144	100	192.168.100.0/24	9a11aba5-5be6-40d0-9b06-0aa2e50f8001.VMM_test	BCF_LN1_VLAN100to200

Hyper-V Hosts

Name	Management IP(s)	Status	Operating System	CPU Load (%)	Memory Usage(%)	VM Count
h1.bsn-109.test	10.8.68.31	OK	Microsoft Windows Server 2016 Datacenter (10.0.14393)	0		2
h2.bsn-109.test	10.8.68.32	OK	Microsoft Windows Server 2016 Datacenter Evaluation (10.0.14393)	0		1

Virtual Machines

Name	ID	Status	Host	Operating System	CPU Load (%)	Allocated Memory	vNIC Count
VM-1	5171348f-d9bc-42ac-890c-2f74eae90a4c	Running	h1.bsn-109.test	CentOS Linux 6 (32 bit)	0	1.02 GB	1
VM-2	d3878ee3-bbdd-4852-93f6-dab617e39a09	Running	h2.bsn-109.test	CentOS Linux 6 (32 bit)	0	1.02 GB	1
VM-3	63ddcbc1-6b49-4ea0-8979-39572703d58a	Running	h1.bsn-109.test	CentOS Linux 7 (64 bit)	0	1.02 GB	1

Figure 5: E-VPN for Hyper-V Auto-created

Contextual Visibility of Hyper-V VMs and Hosts

The CCF GUI presents all the VM-related contextual information through its integration with the Microsoft VMM. The display includes all of the Hyper-V hosts, their VNICs, LAG and the physical fabric interfaces to which the hosts are connected. It also includes the VM endpoint information including the name, Logical Networks, VM Networks, IP and MAC. This visibility coupled with contextual analytics enables fabric-wide troubleshooting -- offering operational simplicity compared to legacy approaches. Net Admins gain full visibility of Hyper-V server virtualization environments, enabling enhanced collaboration with the virtualization team and achieving rapid resolution of issues.

VM-to-VM Troubleshooting

VM-to-VM traffic visibility across the virtual and physical network can be determined using CCF's Fabric Trace feature. The one-click Fabric Trace displays the leaf-spine-leaf traffic path on the physical fabric and identifies specific physical links over which the traffic traverses. Additionally, one-click Logical (policy) Trace displays the logical path (inclusive of VLANs, routing and security policy) taken by the traffic from one VM to another. This level of traffic visibility, which cannot be achieved with box-by-box networking, helps rapidly determine if an application issue is network-related versus compute-related without going through tedious box-by-box troubleshooting.

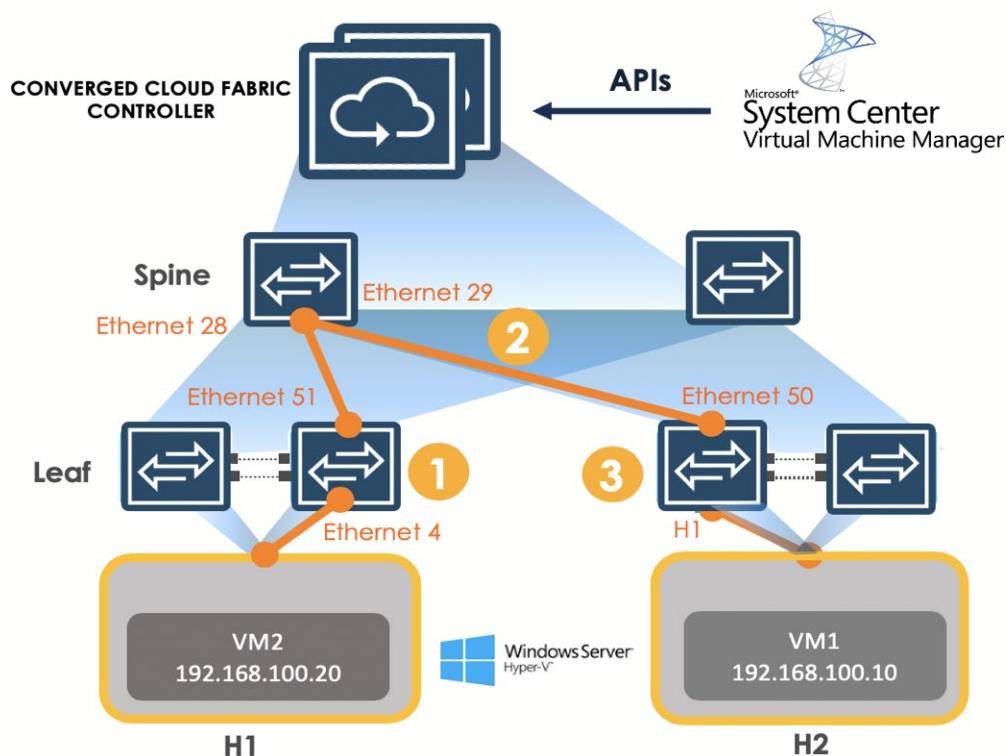


Figure 6: Fabric Trace - VM to VM troubleshooting

Multiple VMMs Connected to Single CCF (Multiple E-VPCs)

In a multi-tenant environment (due to multiple applications, multiple partners or multiple business units) multiple VMMs can be deployed on a single CCF. CCF's tenant-centric E-VPC construct and its integration with VMM enables multiple VMMs to co-reside on the same CCF instance. This allows the administrator to achieve secure segmentation for physical networks with E-VPCs mapping to distinctly separate VMMs and associated Logical Networks. E-VPC have built-in support for overlapping IP/MAC addresses across Logical Networks and also automatically resolve segment (VLAN) numbering conflicts.

Conclusion

Traditional networking vendor solutions bring tremendous box-by-box complexity, leading to change management challenges and a weak security model for Microsoft Hyper-V workloads. However, it's extremely important to consider a solution that speeds up deployment and operational workflows by an order of magnitude while maintaining simplicity and providing real-time contextual visibility. With Converged Cloud Fabric cloud-style self-service provisioning model and zero-touch SDN-based infrastructure, now on-prem data center networks can operate at the speed of Hyper-V hosts and VMs. Network admins have complete contextual visibility and easy button troubleshooting, enabling superior collaboration with server, virtualization and DevOps teams. With strict multi-tenant isolation and delegated administration delivered by on-prem VPCs, CCF also provides best-in-class visibility demanded by applications hosted in Hyper-V private cloud. In summary, with CCF, physical networking delivers agility, simplicity, security and lower total cost of ownership (TCO) and thus participates as a first class citizen in enterprise digital transformation.

For a hands-on demo please go to CCF Labs at <https://ccf-labs.arista.com>.

For more information on Arista Networks please go to www.arista.com

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