

# VMware vSphere with Big Switch Network's Big Cloud Fabric

Achieve physical network automation and enhanced visibility and troubleshooting for VMware virtualized environments by leveraging the integration of Big Switch Network's SDN-based Big Cloud Fabric (BCF) with VMware vCenter. Deploy the solution to gain operational simplicity, application agility, and infrastructure resilience while leveraging the economics of open networking.

## VMWARE VSPHERE BIG CLOUD FABRIC SOLUTION BENEFITS AT-A-GLANCE

### The Solution benefits include:

- Auto host discovery and network creation
- Simplified VM-to-VM troubleshooting
- Best physical underlay visibility and automation for NSX overlay

According to a study by ACG Research<sup>1</sup>, customers achieve:

- 16x Faster Application Deployment
- 12x Faster Troubleshooting
- 60% reduction in TCO

### REFERENCE

<sup>1</sup>ACG Research, "The Economic Advantages of Open SDN Fabrics," November 2015.

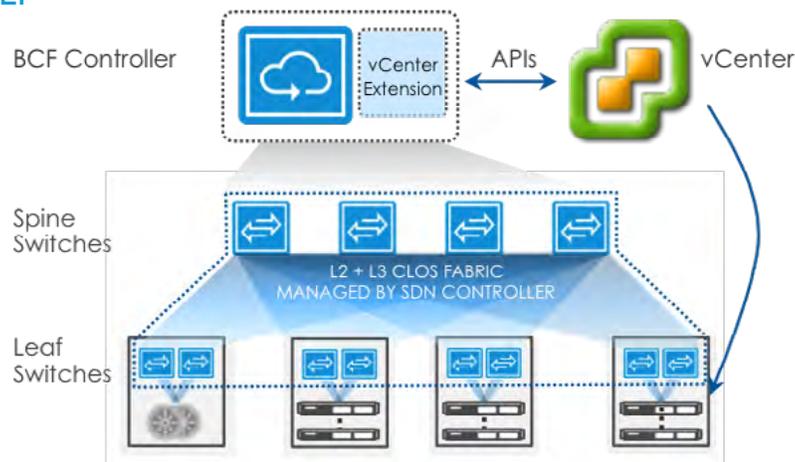
## THE CHALLENGE

Organizations are constantly striving to simplify their operational environment to support dynamic business priorities. They are rapidly adopting software-defined data center (SDDC) technologies to drive agility and cost efficiencies by leveraging best-in-class VMware virtualization technologies for their application workloads. This holistic software-defined approach encompasses automated application deployment across both physical and virtual infrastructure. Networking, however, has traditionally been challenging for data center administrators to design and configure. 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.

## THE SOLUTION

Big Switch Network's Big Cloud Fabric (BCF) is the industry's first SDN-based open networking switching fabric. BCF supports the industry-leading VMware vSphere server virtualization environment to provide network connectivity for ESXi hosts. The BCF Controller acts as a single pane of glass for fabric configuration and integrates with the vCenter for L2 physical network automation. As new VMs are created in vCenter, they are automatically learned in the fabric, and network policies are auto-migrated upon VMs migrating using vMotion. The BCF Controller also acts as a single pane of glass to provide VM-level, as well as vMotion, visibility across the physical fabric. This visibility coupled with advanced analytics enables fabric-wide troubleshooting—offering operational simplicity compared to legacy approaches. The physical fabric automation, visibility and troubleshooting benefits have been extended to VMware NSX-based network virtualization environments to make BCF the ideal SDN underlay. Net Admins gain full visibility of server virtualization environments, helping rapid resolution of issues.

## SOLUTION BRIEF



**Figure 1:** BCF integration with VMware vSphere

## THE SOLUTION COMPONENTS

### VMware vCenter

VMware vCenter Server provides a centralized and extensible platform for managing virtual infrastructure. It manages VMware vSphere 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. The open plugin architecture of vCenter Server enables third party integration, enabling new capabilities such as automation through integration of physical and virtual management tools, capacity management and business continuity.

### Big Cloud Fabric

BCF embraces hyperscale design principles to enable rapid innovation, operational simplicity with TCO reduction.

- **Open Networking Switch Hardware:** BCF software is implemented on multi-vendor open networking hardware (whitebox or britebox), providing vendor choice and dramatic cost advantage.
- **Hierarchical Control Plane:** The BCF control plane is a combination of (1) externalized SDN controller and (2) few key control functions off-loaded to distributed switch OS for scale and resiliency. The SDN controller offers simplicity with a single pane of glass for fabric management and zero-touch operations.
- **Core-and-Pod Design:** BCF is deployed on a per pod basis with multiple pods connected to an existing core router. This modular approach simplifies automation, enables seamless brown-field insertion, capacity planning and rapid innovation.

Customers are deploying BCF pods for multiple use cases, including server virtualization with VMware, Big Data analytics, private cloud, virtual desktop infra (VDI) and multiple vCenter-based logical vPODs.

## NETWORK AUTOMATION WITH VSPHERE AND BCF

The BCF/vSphere solution streamlines application deployment workflows by automating the physical network configuration for VMware virtual workloads. The BCF controller acts a single point of integration with vCenter through a vCenter extension developed using vCenter APIs. It gets notified of events from the vCenter, 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 VMware environments:

### Automatic Host Detection and Link Aggregation

ESXi hosts connected to BCF are automatically discovered by BCF controller using LLDP/CDP initiated on vSphere virtual switches. The BCF 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.

### Automatic L2 Network Creation & VM Learning

As part of application deployment process, vCenter creates, modifies or deletes VMware virtual switch port-groups. BCF controller gets notified of these events and automatically creates, modifies or deletes the corresponding BCF Layer-2 network segments. A newly created VM in the vCenter is dynamically learned by BCF as an endpoint. The BCF controller then enables segment membership for the designated LAG connected to the corresponding host and programs the forwarding tables. If the added VM is the first one on the host for the vCenter port-group, the corresponding BCF segment is provisioned on the host interface.



Figure 2: BCF UNDERLAY AUTOMATION AND VISIBILITY FOR VMWARE NSX

**Network Policy Migration for vMotion**

After an application is deployed and VMs are up and running, vMotion is a powerful capability to seamlessly move VMs from one host to another. When vMotion is initiated in vCenter, The BCF controller gets notified of the new location of the VM information and migrates the network policies dynamically and updates the forwarding tables with the new information. If the VM is the first one in that VMware port-group on the new host, BCF will automatically provision the VLAN on the new host’s LAG port. Similarly, if the VM is the last one on the VMware port-group on the old host, BCF will prune the port group from the old host after the vMotion is complete.

**SIMPLIFIED VISIBILITY AND TROUBLESHOOTING**

The key challenge with networking in virtual environments is the lack of visibility on the end-to-end connectivity between VM endpoints across both the virtual and physical networks. The BCF/vSphere solution offers significant benefits to data center administrators by providing advanced end-to-end visibility and enhanced troubleshooting capabilities, all exposed through a single pane of the glass, the BCF GUI.

**Visibility at Virtual Machine level**

The BCF GUI presents all the VM-related information that it learned from the vCenter. The display includes all of the hosts, their vmNICs, and the physical fabric interfaces to which the hosts are connected. It also includes the VM endpoint information including the name, logical segment, IP, MAC, and LAG. All of this information helps the admin get a quick understanding of fabric configuration to begin a troubleshooting session.

**VM-to-VM Troubleshooting**

VM-to-VM traffic visibility across the virtual and physical network can be simulated using BCF’s test path feature which displays on the controller both physical and logical path taken by the traffic from one VM to another. This level of visibility to traffic, 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 trouble ticket processes.

**Fabric Analytics for VMware Networking**

BCF provides advanced fabric analytics for VMware networking with a graphical representation of all VM-related information (name, creation time, pNIC info, port-groups), and time-series of events related to VMs. This is a tremendous asset for troubleshooting as the administrator can get to the details of specific events for one or more VMs or can zoom into a timeslot to obtain all events that may have occurred during the period.

**BCF’S UNDERLAY AUTOMATION, VISIBILITY, AND TROUBLESHOOTING FOR VMWARE NSX**

When deploying NSX-v (NSX for vSphere) based overlay for network virtualization and/or micro-segmentation, network teams are often concerned about box-by-box physical network being black boxes to overlays. Architecturally, NSX being an SDN overlay (operating as one logical v-switch) is best served by an SDN underlay (operating as one logical p-switch) like the Big Cloud Fabric.

**Physical Fabric Automation for VMware NSX**

When BCF is deployed with vCenter and VMware NSX for network virtualization, all the advanced automation benefits from the BCF integration with vCenter are available to the network administrator. When NSX creates vCenter port-group with an assigned transport VLAN for the VTEPs (VXLAN Tunnel Endpoints) on each of the ESXi hosts, BCF automates the provisioning of the corresponding logical segment for the transport VLAN to enable VTEP communication. It also auto-learns all the VTEP endpoints and the VMs behind the VTEPs.

## SOLUTION BRIEF

### Physical Underlay Visibility and Troubleshooting for VMware NSX

Providing NSX overlay visibility to BCF underlay can be a great asset for network administrators to have a consistent and combined view of the overlay and underlay environments. BCF controller provides NSX cluster/VTEP visibility, visibility for NSX VXLAN traffic through the physical fabric using BCF test path capability, and the use of BCF's Fabric Analytics for NSX-v overlay visibility. BCF's Fabric Analytics module is extended to include both VM-level and overlay network visibility. Correlations across VMname, VXLAN ID (or VNI), and Logical Switch are also provided to simplify debugging of VM connectivity issues. The VTEP-to-VTEP fabric trace capability helps troubleshooting of the physical underlay fabric a very simple operation, making the SDN-based physical fabric the best underlay for the SDN-based NSX overlay.

### MULTIPLE VCENTERS CONNECTED TO SINGLE BCF – LOGICAL VPODS

When cloud service offerings are built with VMware vSphere, multiple vCenters are deployed for multiple tenants leveraging the cloud service. BCF has extended capabilities to integrate across multiple vCenters, with a separate tenant created for each vCenter. This allows the administrator to achieve secure segmentation for physical networks with logical tenants mapping to distinctly separate administrative domains for each vCenter. In addition, this capability enables support for overlapping IP addresses across vCenters.

Running multiple vCenter instances on a unified SDN fabric providing automation and visibility into all things networking through a single pane of glass, enables seamless provisioning and management of the physical networks as well as VM-level visibility and analytics that significantly enhances end-to-end troubleshooting. The benefits of multi-vCenter integration leveraged by a managed cloud service provider, U2 Cloud, have been detailed here. The multi-vCenter solution is also beneficial for ISV's QA teams as they can share common physical network across multiple test teams.

### ABOUT VMWARE

VMware is a global leader in cloud infrastructure and business mobility. Built on VMware's industry-leading virtualization technology, our solutions deliver a brave new model of IT that is fluid, instant and more secure. Customers can innovate faster by rapidly developing, automatically delivering and more safely consuming any application. With 2014 revenues of \$6 billion, VMware has more than 500,000 customers and 75,000 partners. The company is headquartered in Silicon Valley with offices throughout the world and can be found online at [www.vmware.com](http://www.vmware.com).



#### Headquarters

3965 Freedom Circle, Suite 300  
Santa Clara, CA 95054

+1 650.322.6510 TEL

+1 800.653.0565 TOLL FREE

[www.bigswitch.com](http://www.bigswitch.com)

[info@bigswitch.com](mailto:info@bigswitch.com)