Converged Cloud Fabric for Nutanix Enterprise Cloud

Is it possible to architect an enterprise cloud as good as a public cloud?

Midsize enterprises (MSEs) need networking technologies that public cloud providers have spearheaded in data center architecture to enable a frictionless, self-service experience for application deployment. Organizations are eager to bring the same innovation, operational agility and simplicity into managing on-premises applications. Legacy infrastructure has not been able to meet the evolving needs of enterprise applications because they are manual, complex, and siloed.

Enterprises need cloud-like infrastructure that is built upon software-defined principles to eliminate complexity, to enable agile provisioning of applications and to dynamically scale infrastructure with the application needs.

Nutanix Enterprise Cloud is offering a hyper-converged stack that breaks down silos of compute and storage to enable linear scaling of application performance and capacity without performance bottlenecks, expensive overprovisioning or disruptive downtime. Physical networking, however, has remained challenging with outdated, box-by-box CLI-based approach which simply cannot be operated in cloud timelines.

With traditional solutions, deployment of the network takes weeks, basic ongoing operations require manual, trouble-ticketing processes and complexity multiplies when the network needs to be scaled. As a result, a significant chunk of IT effort is spent on just scaling and managing infrastructure rather than focusing on applications and business value they provide.

Achieving a self-service application model for Nutanix Enterprise Cloud requires an approach where standing up a network is as simple as acquiring a public cloud VPC, ongoing network operations are completely automated, and trouble-shooting is extremely simplified.

The Solution

Arista and Nutanix are transforming data centers by leveraging public cloud constructs as first principles for architecting enterprise private clouds. Arista's Converged Cloud Fabric provides invisible (zero-touch) networking to Nutanix hyperconverged infrastructure (HCI) based on Acropolis Hypervisor (AHV). CCF leverages cloud-first networking principles in two ways:

1. Leaf-spine design with SDN controls, and
2. Public cloud VPC-style logical networking that is API integrated with Nutanix Prism.

This joint solution enables unprecedented operational velocity, network automation at VM speed and end-to-end network visibility & troubleshooting. With Arista + Nutanix Enterprise Cloud operating just like a public cloud in terms of economics and operational workflows, customers can now optimize app placement across public and private clouds based on app's needs for elasticity, cost and performance. In addition, the solution offers networking services through Nutanix Flow which enables simplified policy management and increased application security and visibility.

CCF embraces the following hyperscale design principles to enable rapid innovation, operational consistency and TCO reduction:

- Logical VPC-style networking with Enterprise VPCs (E-VPCs): CCF provides public cloud-style logical networking by offering Enterprise VPCs as the unit of network automation and visibility, thus enabling the simplicity and agility of public cloud networking and consistency of networking principles across enterprise and public clouds.

- Software-Defined Principles: The CCF is controlled by an SDN controller offering simplicity with a single pane of glass for fabric management and zero-touch operations. The CCF controller also acts as the single point of integration with Nutanix Prism to automate physical networking and to offer deep visibility, analytics and troubleshooting from a central dashboard.

- Core-and-Pod Design: CCF 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.
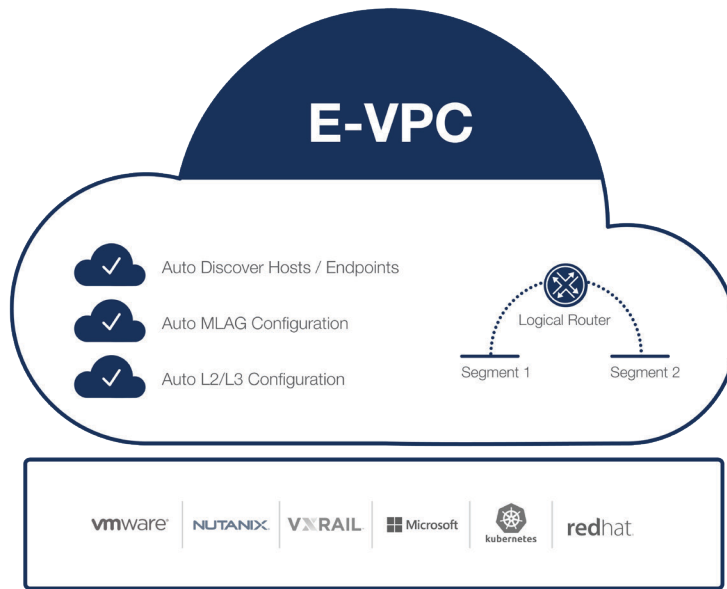
Solution Architecture
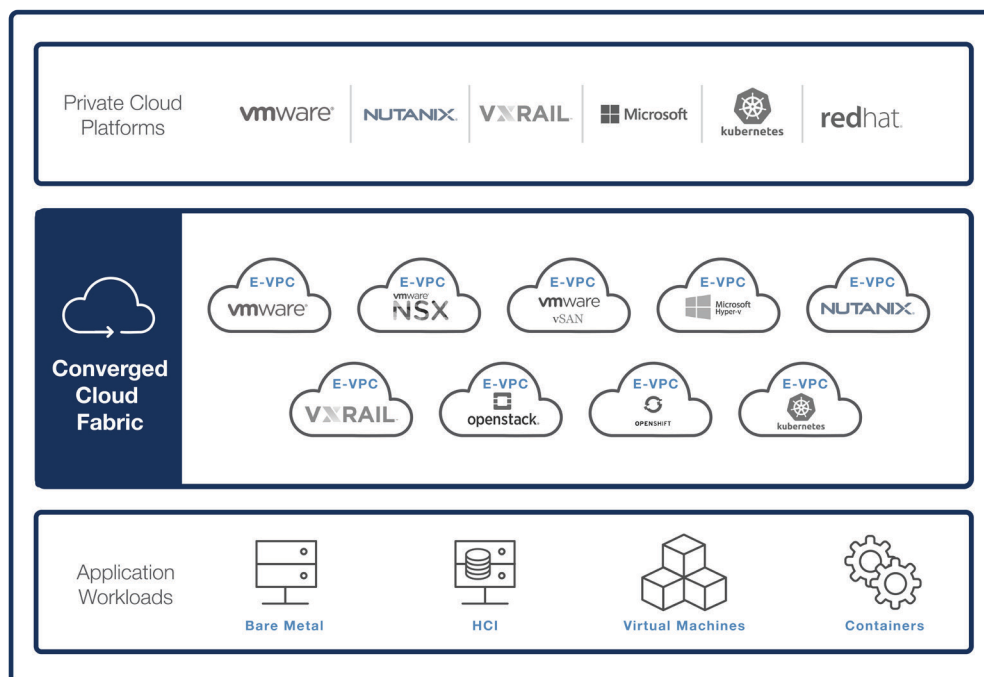
Solution Benefits

The Converged Cloud Fabric controller acts as a single point of integration with Nutanix Prism to offer Enterprise VPC-level network automation, visibility and troubleshooting benefits.

Network Automation for Nutanix E-VPC

Automatic Bootstrapping of Nutanix AHV Hosts

Nutanix bare metal nodes are bootstrapped by CCF through a dedicated Nutanix management sub-network within an infrastructure VPC. An existing AHV cluster can be migrated to CCF or a new cluster can be deployed using the Nutanix foundation tool.

### Automatic AHV Host Detection and Fabric Admission

When CCF connects with Nutanix Prism, a Nutanix E-VPC is created as a logical construct for operations within CCF. All Nutanix hosts within the E-VPC are automatically detected through link detection mechanisms and admitted into the fabric through the automatic creation of multi-chassis LAG (MLAGs) to the fabric switches. In this way, the entire fabric is brought up in a zero-touch fashion.

Automatic formation of MLAGs according to Nutanix Prism Configurations

E-VPC based Automated L2 Networking for Nutanix AHV

As networks are configured on Nutanix Prism for VMs on AHV nodes, the integrated solution enables automatic configuration of logical segments within the E-VPC for the Nutanix' endpoints in CCF. Newly created VMs are dynamically learned as an endpoint in CCF and the corresponding network segments are automatically created within the E-VPC. When AHV VMs and the associated networks are deleted or modified on Nutanix Prism, the CCF automatically deletes or modifies the corresponding logical segments within the E-VPC.
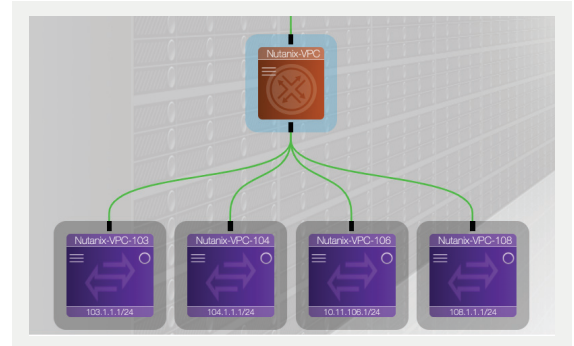
Automatic formation of Enterprise VPC & network segments according to Nutanix Prism Configurations

Automated Distributed Logical Routing

When VMs are associated with a new, different network segment in Nutanix Prism, CCF learns this and automatically configures logical routing across various segments in the E-VPC and distributes it throughout the physical fabric. This completely redefines the operational model compared to the legacy box-by-box complex command-line configurations needed to establish routing between the segments.
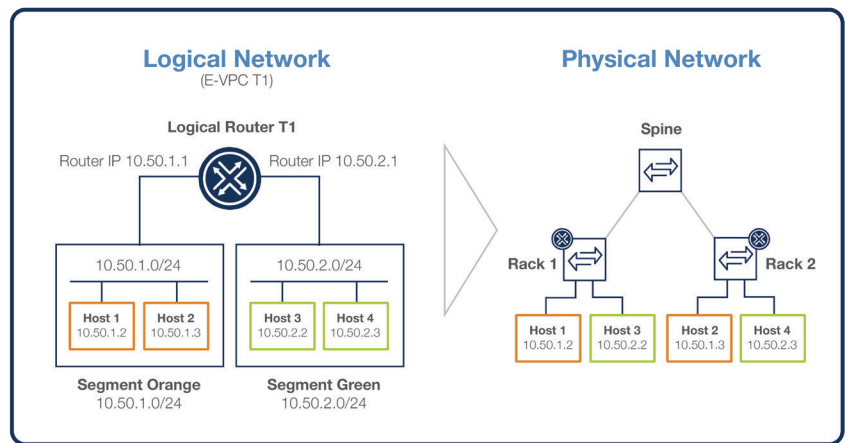
Flexible & Customized Automation Options

CCF E-VPC automation allows different automation flexibility levels to fit enterprise organizational needs. In the most restrictive manner admins can configure Nutanix Prism Integration in CCF to provide visibility into Nutanix AHV clusters without subscribing to any automatic network configuration changes. On the other hand, admins can configure Prism integration in CCF to provide full-fledged benefits, including automated E-VPC configurations for a Nutanix AHV cluster to support multi-tenancy use cases within organizations. For example, IT department serving multiple internal organizations (e.g.: Finance/HR, etc.) can automatically provision multiple E-VPCs for each of their customers. Following is a breakdown of the automation flexibility provided in the Converged Cloud Fabric.

Automation Level	Benefits
Visibility Only	Visibility information will be populated in CCF, no automated configuration changes
AHV Host Automation	Visibility + Automatic detection of AHV hosts and Automatic MLAG provisioning
E-VPC Automation	Visibility+ AHV Host Automation+ E-VPC automation to automatically create E-VPCs for AHV clusters Automatically sync L3 default gateway in Prism virtual networks to CCF Distributed Logical Routing

Network Visibility, Troubleshooting & Analytics for Nutanix E-VPC

Nutanix E-VPC-level Endpoint Visibility

CCF Nutanix Prism page displays information of clusters, hosts, virtual switches and the endpoints in a Nutanix E-VPC based on data provided by Prism to CCF. Different tables in CCF provide details of the AHV cluster from different viewpoints.

While the Physical connections table provides the fabric connectivity and mapping details for Nutanix hosts, the Endpoints table provides details of the VMs and can be an excellent starting point for troubleshooting.
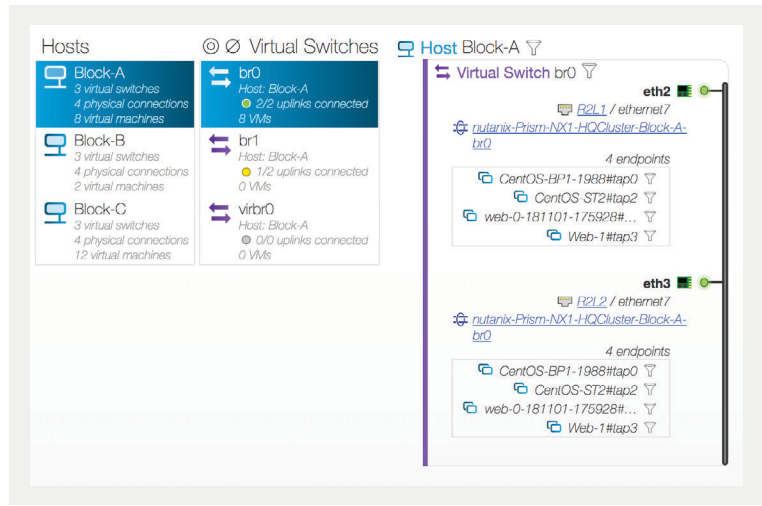
Contextual visibility of Nutanix AHV virtual networks

Fabric Trace for Nutanix E-VPC

VM-to-VM traffic visibility for a Nutanix E-VPC across the entire leaf-spine fabric can be visually displayed on the CCF controller, as shown below. 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 ticketing processes.
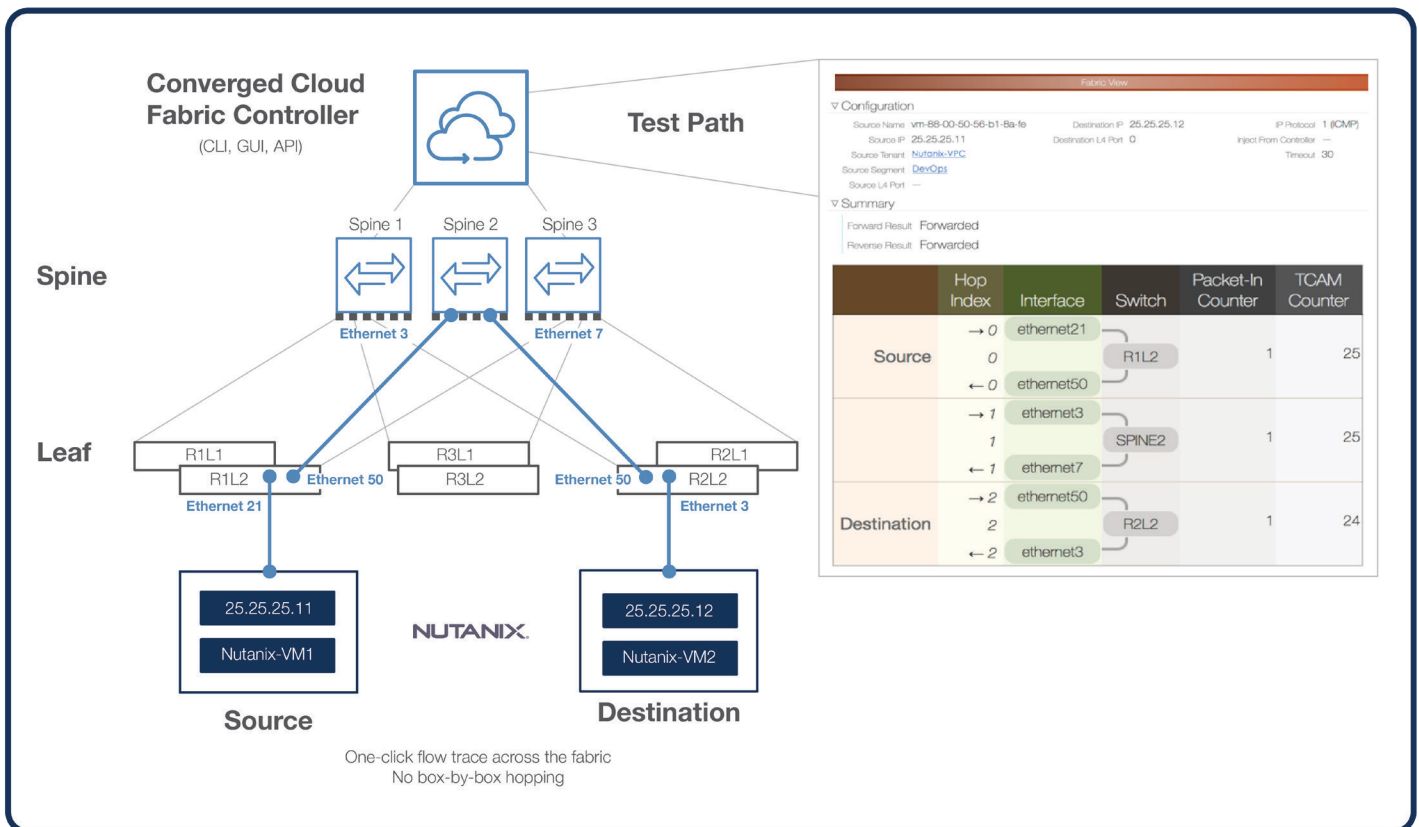
Spanning traffic from Nutanix AHV nodes

CCF Fabric SPAN feature allows admins to monitor and SPAN traffic streams out from Nutanix AHV clusters without knowing the exact physical parameters related to the traffic stream. For example, an admin can instruct the CCF controller to SPAN traffic from a particular AHV virtual network with a couple of clicks.

In traditional networking, the equivalent task would require not only intimate knowledge about where exactly traffic would be originating but also coordination and configuration amongst many individual network devices and ports.

CCF simplifies these SPAN troubleshooting workflows greatly by allowing admins to define the targeted traffic flow parameters using numerous Nutanix AHV metadata information.
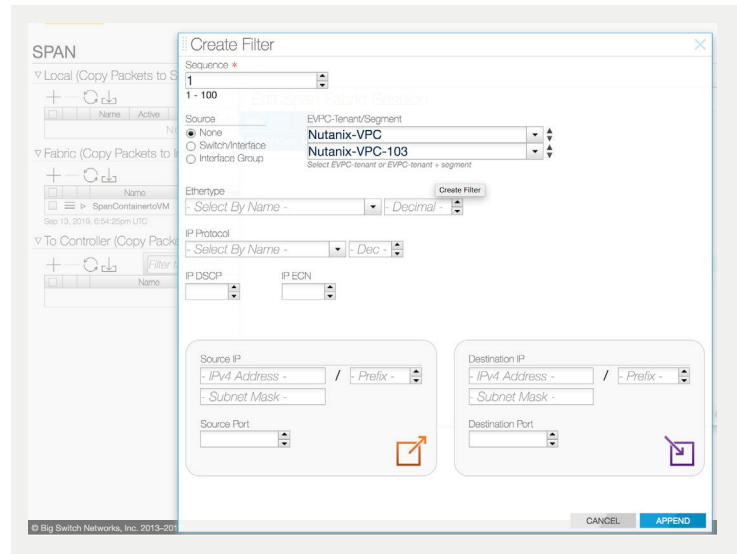
SPAN Fabric configuration in CCF

Fabric Analytics for Nutanix E-VPC

CCF's advanced fabric analytics for a Nutanix E-VPC captures VM-related information (name, creation time, pNIC info, port-groups), and time-series of events related to VMs. This is very beneficial during troubleshooting to narrow down the time interval when specific events occurred.
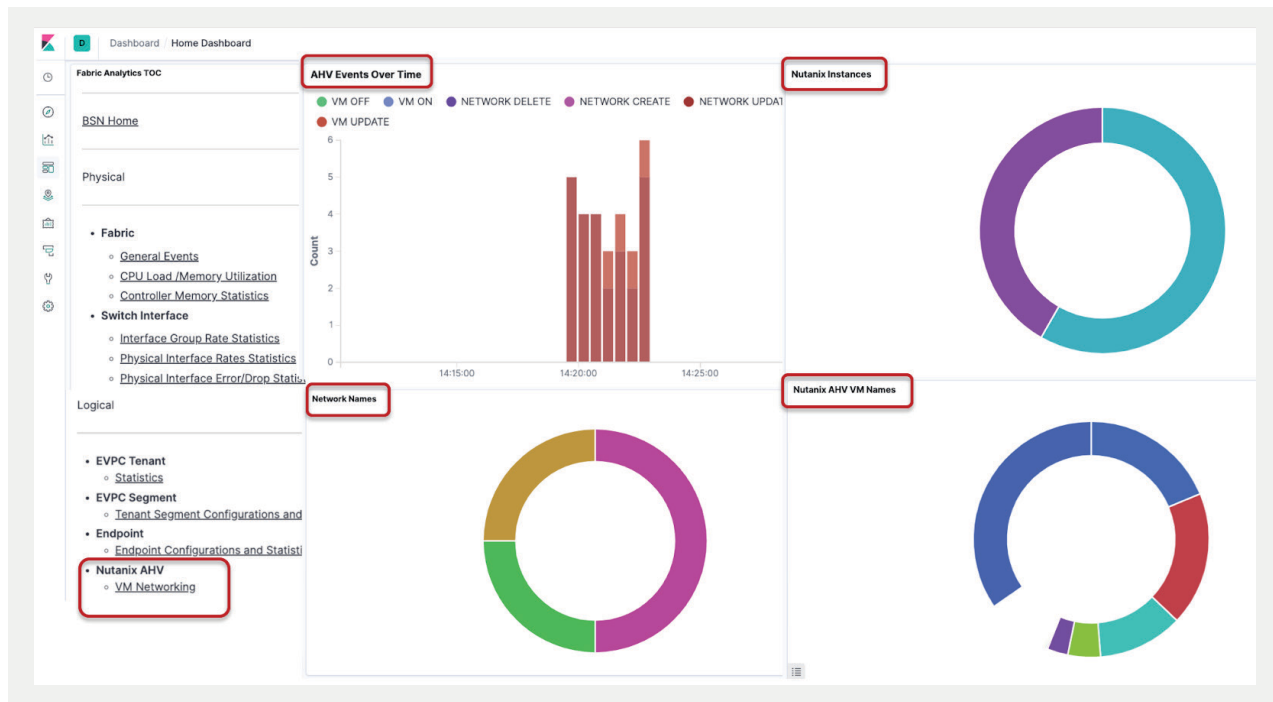

Built-in Fabric Analytics dashboard for Nutanix Prism

Multi-Cluster Automation

Multi cluster connectivity options for AHV and ESXi Hypervisors

Converged Cloud Fabric can greatly simplify connectivity options between Nutanix AHV clusters and Nutanix nodes running ESXi hypervisor. With a couple of click process, you can map your ESXi cluster to one E-VPC in Converged Cloud Fabric and AHV cluster to another E-VPC. As a result, if you are migrating your current ESXi infrastructure to an AHV infrastructure, Converged Cloud Fabric can reduce the networking burden entirely by automating many of the associated connectivity workflows.

For example, depending on your enterprise needs, you can choose to map both the ESXi cluster and AHV cluster to the same E-VPC thus making sure connectivity is seamlessly maintained across both the clusters during the migration period. On the other hand, if you wish to only allow a specific set of connectivity from your current ESXi environment to AHV environments you have the flexibility to pick and choose and customize E-VPC mappings depending on your needs.
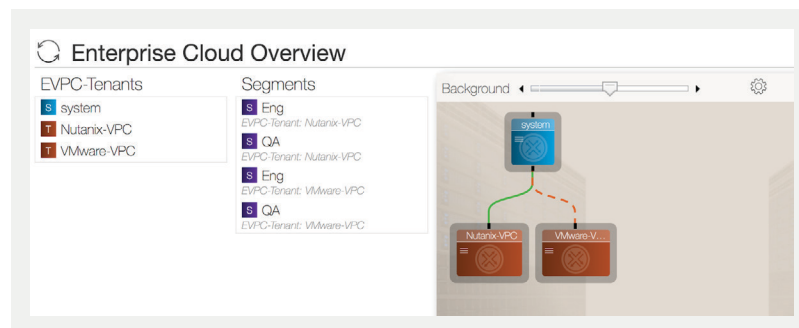
Connectivity details between Nutanix & VMware VPCs in Converged Cloud Fabric

Business Continuity: Extending Network Connectivity Across Regions

Maintaining connectivity across Nutanix AHV clusters in different regions may be crucial to maintaining business continuity. If you operate multiple Nutanix clusters in different datacenters, you can extend the connectivity between these AHV clusters with the help of Converged Cloud Fabric. CCF provides two different flavors of connectivity options to connect across regions: Directly connecting CCF pods (e.g.: connecting with dark fiber), or connecting CCF pods using VXLAN over a Layer3 network. Depending on the needs, admins can pick and choose between these two flavors to establish inter-region connectivity across geographically dispersed Nutanix AHV clusters.

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