

# Next-Generation Data Center Interconnect Powered by the Pluribus Adaptive Cloud Fabric

## Highlights

- Simple, plug and play software-defined DCI architecture interconnects distributed data centers
- Automated, one-touch provisioning simplifies operations
- Standard networking assures interoperability with existing infrastructure
- Improve resource efficiency and elastic workload sharing across sites
- Resilient and highly available architecture to meet disaster recovery requirements
- Embedded telemetry enables pervasive visibility across data centers
- Service insertion, traffic segmentation and multi-tenant services
- Leverages Dell EMC Open Networking switches to reduce the cost of building DCI architectures

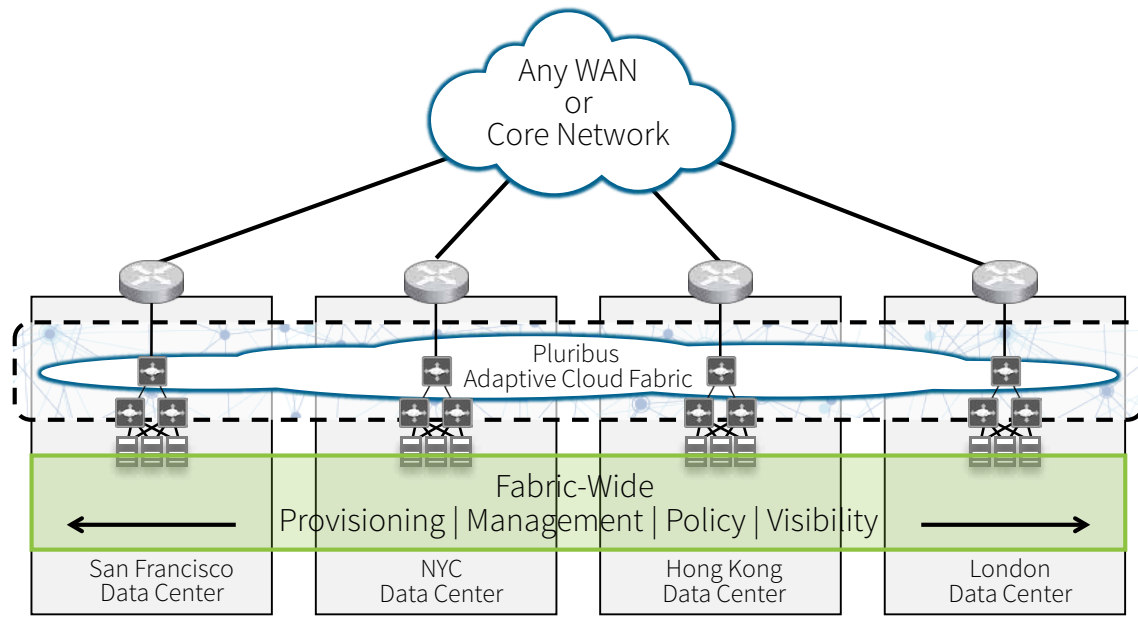
Data Center Interconnect (DCI) is an architecture for connecting two or more geographically distributed data center locations to achieve a cohesive operating environment. With DCI, interconnectivity between distributed data centers goes beyond simple network connectivity to enable high-performance and scale-out architectures that allow multiple data centers to work together in unison more efficiently. DCI enables data centers to seamlessly use pooled IT resources contained across the network to meet scalability requirements. In addition, DCI facilitates workload sharing and service mobility, and enables high availability so that disaster recovery requirements can be met to achieve operational continuity.

Traditionally, Layer 3 Internet Protocol (IP) connectivity and routing protocols such as the Border Gateway Protocol (BGP) have been used to route traffic between geographically distributed data centers. However, the advent of network virtualization and geo-clustering technologies has enabled new interconnection approaches that provide compelling alternatives to the traditional closed and proprietary DCI approaches, which have required significant investments in rigid and complex hardware and software combinations.

## Next-Generation Software-Defined Data Center Interconnect

The Pluribus Adaptive Cloud Fabric architecture has modernized and radically changed the approach to building scale-out DCI architectures. The Adaptive Cloud Fabric enables building a flexible, distributed DCI deployment that enables programmable, software-defined interconnection built upon industry standard Virtual Extensible LAN (VXLAN) encapsulation technologies. Consequently, architecting a DCI deployment with the Adaptive Cloud Fabric extends Layer 2 domains across geographically distributed locations to enable high-speed interconnection with superior scalability and significantly more functionality than legacy approaches. The result is greater agility, improved performance and higher levels of resiliency while reducing operational complexity.

The Pluribus DCI solution enables organizations to simplify their data center network with an adaptive and truly unified distributed fabric that enables seamless interconnectivity and operational agility. Supporting a large number of geographically distributed data centers, the Pluribus DCI solution allows the extension of Layer 2 services across multiple locations connected via any existing WAN or core network. In addition, the Fabric enables the instantiation of Layer 1 pseudowire links allowing the transparent tunneling of any protocol between any two sites connected to the Fabric.



The Pluribus Data Center Interconnect solution enables a powerful and holistic software-defined network that interoperates with existing infrastructure and spans across multiple data centers connected via any existing WAN or core network

## Simple, Controllerless Software-Defined Architecture

Powered by the Netvisor® ONE operating system, the Pluribus Adaptive Cloud Fabric enables a powerful software-defined network foundation that adapts to change, improves efficiency, and streamlines operations with complete interoperability with existing network and data center infrastructure. Featuring a unique controllerless distributed architecture, the Adaptive Cloud Fabric delivers automated plug and play operation, enabling a powerful and holistic software-defined network that interoperates with existing network infrastructure, is highly scalable and is optimized to deliver continuous availability for mission-critical enterprise and service provider environments. When deployed across geographically distributed locations, the Pluribus DCI solution enables simplified network operations, better sharing of resources, improved workload mobility, improved resiliency, and significant improvements in disaster recovery capabilities.

The unique peer-to-peer distributed Fabric architecture eliminates the undesirable limitations and complexities of first-generation hierarchical controller-based SDN architectures. This dramatically simplifies network topologies, eliminates unnecessary network traffic loads generated by controller communications and overcomes the traditional geographic limitations inherent in controller-dependent architectures. The Fabric architecture can scale-out to support many thousands of ports, with multi-terabit capacity, performance and latency predictability, and support millions of concurrent connections. Consequently, the Adaptive Cloud Fabric can be deployed within a single data center or geographically distributed to seamlessly interconnect dozens of data centers over any existing Layer 2 or Layer 3 core or WAN network. The Pluribus DCI solution leverages deployment-proven Dell EMC Open Networking switches to deliver multi-terabit, high-density capacity to support the most demanding data center requirements. Capacity is elastic, so additional switches can be added seamlessly to bring additional ports or bandwidth.

## Interoperates with Existing Networks and Protocols

The Adaptive Cloud Fabric leverages standard Layer 2 and Layer 3 networking protocols so there are no new specialized protocols to implement, eliminating operational disruptions and new IT staff learning cycles. Consequently, the Pluribus DCI solution can be inserted into any existing network as an underlay, overlay, or as a replacement for the data center leaf or spine network while maintaining full interoperability with existing networks, protocols, and network topologies. Enabling seamless distributed interconnection, the Adaptive Cloud Fabric architecture can be deployed over any existing core network or WAN transport already in place, including dark fiber, MPLS and SD-WAN.

### High-Availability and Resiliency

The Pluribus DCI solution delivers exceptional resiliency with support for active-standby or active-active configurations to help minimize outages and service degradations. In addition to traditional standards-based redundancy protocols and strategies, the distributed Fabric architecture enables multi-path optimal distribution to assure that traffic will continue to flow in the event of link failures. As a result of the controllerless Fabric architecture, re-convergence times are dramatically faster, enabling sub-second fail-over in the event of failures. Consequently, business continuity is maintained with service-level resiliency to assure operations during times of failure or resource exhaustion.

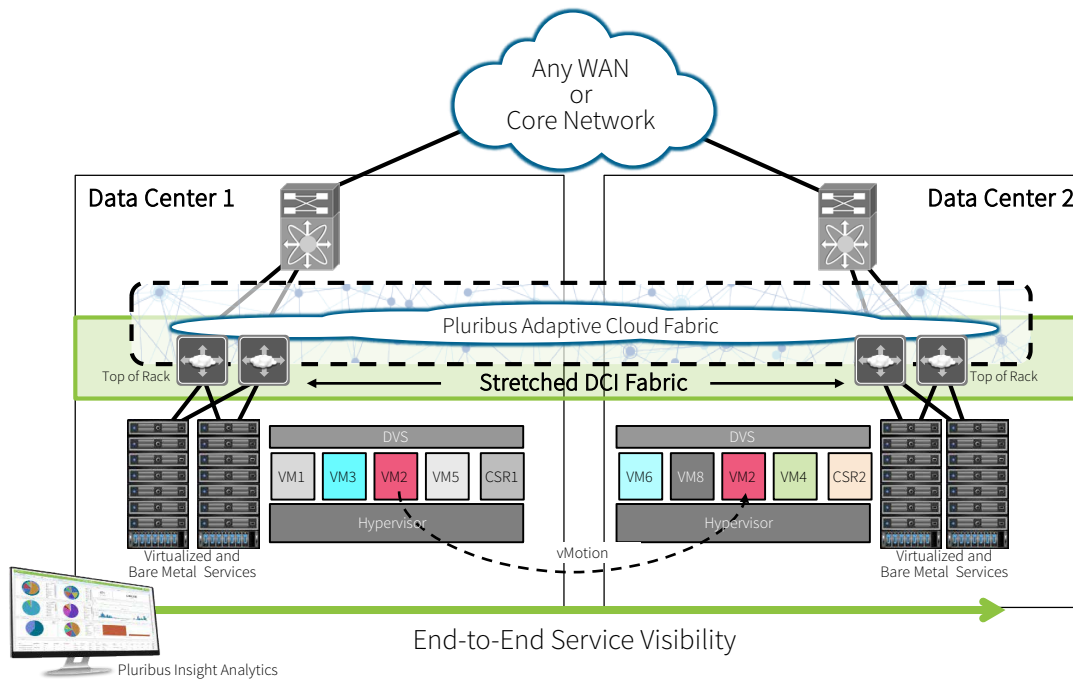
### Advanced Network Virtualization

The Adaptive Cloud Fabric architecture takes advantage of the network virtualization enabled by the Netvisor ONE OS. The network virtualization decouples network resources from the underlying hardware and segments the operating system and hardware resources into virtual network containers, similar to how a hypervisor virtualizes a bare metal server. This enables a single switch to instantiate multiple virtual networks enabling multi-tenant services, granular network segmentation and integrated virtualized network services and functions into Open Network switch hardware.

Each virtual network container has its own software processes and dedicated network resources, including dedicated routing data and control planes, and an independent management environment. The virtualized network containers are not hardware bound, so a virtualized network container can be dynamically allocated to any switch, be duplicated across switches, or can be moved on-demand and reallocated from one physical switch to another physical switch across the DCI Fabric enabling exceptional operational agility.

### Dynamic Network Segmentation and Security

The Adaptive Cloud Fabric simplifies the process of defining and enforcing security policy while improving control and delivering consistent protection of virtualized or bare metal applications and services. The Fabric allows the efficient deployment of granular filtering, traffic segmentation and dynamic policy for all traffic. Since the global Fabric operates as one entity, segmentation can cross global DCI boundaries to secure network traffic, including north-south and east-west traffic, regardless of location to meet virtually any security requirement.



The Pluribus DCI solution simplifies network operations, enables resource sharing, workload mobility, and resiliency to meet active-active HA/DR requirements

Flexible multi-tenant services allow administrators to define isolated user groups to support any number of strict tenants that can span across multiple physical locations. In addition, centralized policy with distributed enforcement enables granular Fabric-wide control and global policies to be applied on a per-user, per-application, per-flow basis. Segmentation is also ideal for segregating development, test, and production environments across a multi-site data center environment.

## Dynamic Service Insertion

Dynamic service insertion enables the efficient sharing of physical or virtual services and resources such as firewall, intrusion protection, security services, application delivery controllers (ADC) and load balancers across the interconnected Fabric. This allows the centralization of policy and enables the dynamic assignment of services across the Fabric regardless of end-point location or traffic origin.

Centralization simplifies appliance integration and administration, as all traffic across the Fabric dynamically shares access to pooled resources eliminating appliance sprawl and reducing the number of appliances needed to support operations. In addition, availability and resiliency for appliances is improved as multiple appliances can be shared to meet service demands across the Fabric. Service insertion enables new appliances and services to be quickly added and provisioned into existing networks reducing deployment time from days to minutes.

## Simple and Automated

The Pluribus DCI solution is simple to deploy and operate. The Adaptive Cloud Fabric is built for automation and agility with native atomic programmability enabling dynamic Fabric-wide provisioning and configuration of network resources and security policies to quickly support new applications, resources and workloads. The Fabric provides a single point-of-control that allows one-touch provisioning for all devices deployed across the fabric, regardless of their location, eliminating the complexity and time-consuming burden of traditional box-by-box management. Any Fabric member can act as the logical management point to define and provision Fabric-wide configurations, services and policies across all Fabric member switches with a single command via RESTful APIs, or Command Line Interface (CLI) with functional parity. Dynamic roll-back allows the network operator to quickly restore a previous configuration across the entire fabric in the event of configuration errors to minimize disruptions.

Enabling both NetOps and DevOps automation, automation tools, such as Ansible, or the Pluribus UNUM™ management platform are also available to provision the DCI environment. In addition, traditional NetOps interfaces and a wide array of Linux tools are supported for scripting and automation. As a result, workflow automation reduces configuration time by up to 90% over traditional box-by-box management, lowers the risk of configuration errors, and dramatically improves service velocity and operational agility.

## VMware Integration Extends Automation

The Adaptive Cloud Fabric integrates with VMware vCenter enabling one-touch provisioning of network, compute, and storage services from a single management interface. Leveraging the familiar vCenter console, a virtualization administrator can orchestrate and provision network resources in conjunction with ESXi hosts, and VMs. vSAN services are also automated, including implementing vSAN cluster configurations across the network Fabric without the manual configuration of multicast.

In addition, the Adaptive Cloud Fabric integrates with the VMware NSX Controller to automate the off-load of L2 VTEP Gateways directly on the switch, thus extending the reach of NSX virtual networks to bare metal network services and applications. This increases flexibility, simplifies deployments, and reduces human touch points, speeding time-to-deployment, and further minimizing the risk of configuration errors.

## Integrated Network Visibility

The Adaptive Cloud Fabric embeds monitoring telemetry on every port to monitor network, service and application flows at the speed of the network. The embedded telemetry exposes important service behavior characteristics such as application type, connection state, and end-to-end connection latency. The embedded telemetry monitors all application flows, including traffic within VXLAN tunnels. Performance metrics can be viewed through standard RESTful APIs, IPFIX, command line queries, or can be visualized by the Pluribus Insight Analytics™ platform. The Insight Analytics platform provides comprehensive application-aware Network Performance Management (NPM) and operational intelligence to improve real-time and historical visibility to assure service availability, performance and quality. Pluribus vProbe technology extends visibility into VMware servers to expose the performance related characteristics of application traffic traversing the hypervisor.

## Built on High-Performance Dell EMC Open Networking Switches

The Pluribus DCI solution is built on top of the deployment-proven Dell EMC Open Networking switching portfolio. Purpose-built for virtualized, software-defined data centers, Dell EMC Open Networking switches deliver a cost-effective, high-performance, and highly scalable network foundation for virtualized workloads and demanding data center deployments. The Dell Technologies high-density, one rack unit (1RU) switches support the Open Network Install Environment (ONIE) for easy, zero-touch operating system installation.

## The Value of Open Networking Backed by Dell Technologies

Dell Technologies together with Pluribus Networks, offers a virtualized, software-defined and programmable network Fabric architecture that assures optimum performance and availability of DCI with simplified management and powerful performance analytics. The combination of Dell EMC Open Networking hardware and the Pluribus Adaptive Cloud Fabric delivers a dynamic DCI solution that is optimized to empower any size organization to eliminate complexities, do more with their next generation data center architectures, and speed the time to value for any distributed data center environment. The combined Dell Technologies and Pluribus DCI solution is backed by Dell Technologies to ensure your organization is supported from design through deployment and beyond to reduce risk and ensure project success.

### Sample Use Cases

- **Disaster Recovery** — Enable physically remote data centers to support disaster recovery strategies with the ability to dynamically enable all resources to logically co-exist and appear as local infrastructure. Remove the physical delineations between data centers to improve replication. Configurations can be dynamically aligned to active-active or active-standby requirements as required.
- **Application Optimization** — Elastically share workloads and resources and instantiate virtual machines across multiple sites over the distributed Fabric for active-active or active-standby configurations. Adaptive Cloud Fabric vPort endpoint tracking capabilities assure robust application performance by keeping application instances in the same logical cluster with IP addresses retained and auto-detection of mobility events.
- **Workload Mobility** — Eliminate boundaries between distributed data centers by enabling the seamless sharing of resources and the movement of applications and data between different and distant centers. Improve efficiency, relieve capacity constraints or facilitate expansion with workload movement across the fabric enabling access to critical resources in any location at any time as everything across the network is recognized as a local resource.
- **Scale-out Hyper-Converged Infrastructure deployments** — Implement the Fabric by rack, pod, location or multi-location to support new or existing instances of hyper-converged infrastructure such as Nutanix®, VxRail™, or vSAN deployments. The Adaptive Cloud Fabric optimizes HCI synchronization, stretches resource sharing across locations, speeds workload mobility, provides workload level visibility, and significantly enhances disaster recovery capabilities.