Product Overview

Highlights

- Completely software enabled and built with open networking principles
- Automates the underlay and virtualizes the network with a service-rich overlay
- Powered by the Linux-based Netvisor ONE Network Operating System
- Eliminates multiple SDN controllers, reducing costs and simplifying the network
- Seamlessly spans geographically distributed, multi-location environments
- Fully interoperable with existing brownfield network deployments
- Fabric-wide programmable, API-driven automation and policy management
- Secure traffic segmentation and strict multi-tenant services
- Integrated monitoring telemetry for pervasive network and application visibility
- Integration with vCenter, OpenStack and Kubernetes orchestration solutions

Pluribus Adaptive Cloud Fabric

Radically Automating and Simplifying Networking

To empower digital transformation and frictionless multi-cloud operations, the network needs to evolve from being static and hardware-bound, to a more dynamic, software-driven environment. Legacy networks just can't deliver the agility and flexibility organizations require to meet evolving operational demands. To reduce complexity and improve operational agility, IT organizations need a simpler and more integrated approach to enable faster deployments, increase agility and greater scale to manage infrastructure and applications.

Virtualized and automated compute and storage have demonstrated what's possible when it comes to increasing efficiency, simplifying configuration and maximizing agility when the right technology is deployed. The advantages of a modern, virtualized network are compelling, and to create data center and campus environments that have the same level of automation as public cloud, one must virtualize everything — compute, storage, and the network.

Adaptive Cloud Fabric Overview

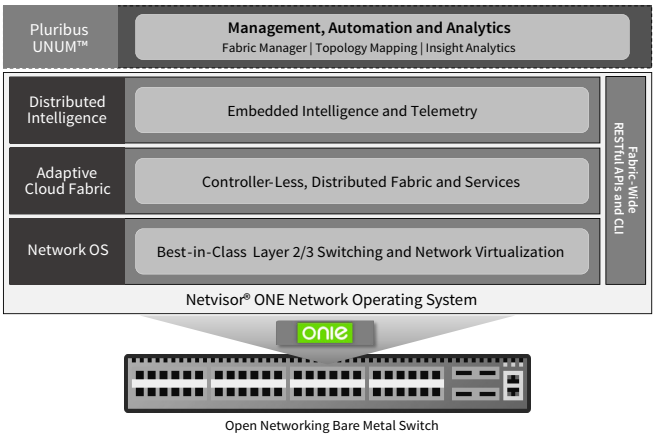
To reduce network complexities and meet escalating business demands, Pluribus Networks has changed the way Software-Defined Networks (SDN) are built and operated by radically simplifying the network architecture and operating model. Based upon the next-generation of SDN technology, the Adaptive Cloud Fabric™ (ACF) empowers organizations to speed their transition to a completely automated network that supports software-defined data center and cloud automation principles with a simpler, non-disruptive and more transparent architecture that makes it easier to deliver, manage, and secure service delivery.

With its controllerless, distributed architecture, ACF delivers automated plug and play operation, enabling a powerful and holistic software-defined network that adapts to change, improves efficiency, and streamlines operations. ACF automates the underlay with SDN and, in the same architecture, delivers a service-rich VXLAN overlay that virtualizes the network and is completely automated and abstracted from the underlying physical network. ACF uses standardized protocols to interoperate with existing brownfield network infrastructure, is highly scalable and is optimized to deliver continuous availability for mission-critical enterprise and service provider environments.

The Adaptive Cloud Fabric can be deployed across a single data center, across a campus, or geographically distributed to seamlessly interconnect dozens of data centers or aggregate the campus edge over any existing Layer 2 or Layer 3 core. Unlike controller-based solutions that function as manually-stitched islands, ACF creates a single programmable and completely automated architecture across multiple locations to support simple VM and container workload mobility, as well as modern active-active data center deployments. ACF can scale-out to support many thousands of ports, with multi-terabit capacity, performance and latency predictability, and can support millions of concurrent connections.

Powered by Netvisor ONE OS

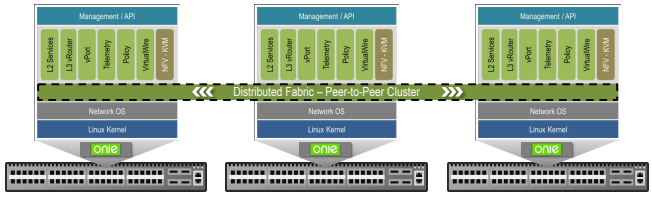
The Adaptive Cloud Fabric is powered by the innovative Pluribus Netvisor® ONE Network Operating System (OS). Netvisor ONE is a Linux-based open, secure and programmable next-generation Network OS that delivers best-in-class Layer 2 and Layer 3 networking foundation and is built to optimize the power and performance of bare metal open networking hardware. Deployment-proven in production mission-critical enterprise and carrier networks, Netvisor ONE meets the most stringent performance requirements, and delivers the maximum levels of reliability and flexibility at scale without compromise. Netvisor ONE OS can be deployed as a stand-alone OS where each switch can be individually managed, including using tools such as Ansible. That said, the core component of this technology is the Adaptive Cloud Fabric, a distributed and controllerless SDN underlay and overlay solution that is powered by Netvisor ONE.



The Netvisor ONE Software-Defined Architecture

Adaptive Cloud Fabric Architecture

The Adaptive Cloud Fabric enables a simple and secure next-generation software-defined peer-to-peer distributed network architecture that clusters Netvisor ONE powered switches into a symmetrical, unified operating domain. The Adaptive Cloud Fabric software operates as a distributed application running in the user space of each switch, leveraging the CPU and memory footprint of the switches that must be deployed for physical connectivity and high speed packet forwarding. This highly efficient, distributed approach dramatically reduces integration and deployment complexity by eliminating multiple external controllers required for underlay and overlay automation. Costs are reduced through the elimination of a number of controllers that traditional SDN offerings typically require at every data center site. This approach also provides brownfield interoperability with existing networks, allowing a non-disruptive and graceful migration to an SDN architecture.



The Adaptive Cloud Fabric architecture clusters member switches into a symmetrical, unified operating domain and eliminates the cost and integration, deployment and management complexity of underlay and overlay controllers

To enable massive scale and support distributed deployments, ACF features an innovative distributed control plane that allows multiple Netvisor ONE powered switches to be operated and managed as a single, distributed virtualized switch. Each physical switch maintains its own standards-compliant control and data plane to support massive scale, high-performance, interoperability and resiliency.

ACF runs on top of any standard Layer 3 underlay network inside or outside (WAN) the data center, allowing multiple fixed form factor switches to be managed as a single, virtualized large chassis switch even when distributed across multiple sites. The capability to span geographically dispersed sites enables a number of dynamic services and use cases that have previously been very challenging to achieve.

To meet the most stringent high availability requirements, the Adaptive Cloud Fabric architecture has no single-point-of failure and delivers a high degree of resiliency with fabric-wide sub-second failover. Fabric automation provides a single-point-of-management and control, distributes intelligence, integrates a broad range of advanced network services, and provides pervasive visibility for all traffic traversing the fabric.

Existing Network Interoperability

The unique peer-to-peer distributed architecture eliminates the undesirable limitations and complexities of SDN controllers and non-standard protocols like OpenFlow. The controller-free architecture, combined with ACF's ability to run as an application in the switch without changing the fundamental way the switch communicates, enables seamless insertion into existing networks and full interoperability with any standards-based networking equipment, protocols, or network topology. This allows Netvisor ONE powered switches to be inserted into the Leaf or Spine layers or into ring topologies, to enable a completely flexible and graceful migration to a software-defined network architecture, while preserving existing technology investments to significantly lower the total cost of ownership (TCO).

Runs on Open Networking Hardware

The Adaptive Cloud Fabric runs on many Open Compute Project (OCP) and Open Network Install Environment (ONIE) hardware compliant switches, including devices from Celestica, Champion One, Dell Technologies, Edgecore, and the Pluribus Freedom™ series of network switches. This flexibility allows organizations the choice of hardware to build scale-out networks with any combination of 10, 25, 40, 100 or 400[1] Gigabit Ethernet interfaces.

Netvisor ONE can be deployed as a single OS software image to support any mix of multiple vendor open networking switches in all deployment points, including the data center leaf and spine and campus aggregation for complete deployment flexibility. This allows building a network with multi-vendor hardware to flexibly support evolving physical interface requirements unified by a common and consistent OS to reduce operational complexity, improve efficiency and lower costs.

Manageability, Programmability, and Automation

The Adaptive Cloud Fabric architecture is built for automation and agility with native and atomic fabric-wide programmability—enabling operational changes and new services to be rolled-out quickly and rolled back, as needed. Any ACF 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 UNUM Fabric Manager, the RESTful APIs, or Command Line Interface (CLI) with functional parity enabling both NetOps and DevOps automation.

Tools such as Ansible can be used to automate provisioning or use the Pluribus UNUM™ management platform are also available to automate provisioning and management of the entire network. In addition, the Netvisor ONE OS supports a wide array of Linux tools for scripting and automation, and supports traditional NetOps interfaces for SNMP, Syslog, sFlow and IPFIX. As a result, the ACF 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.

All switch-to-switch communications, network-wide configuration, policies and state information are dynamically updated across the fabric in real-time. An advanced transactional model guarantees that device configuration is consistently maintained across every member network node. To minimize configuration errors, the Netvisor ONE OS offers dynamic configuration roll-back capabilities that allow the network operator to instantaneously restore a previous configuration across the entire fabric to prevent unwanted disruptions.

VMware, OpenStack and Kubernetes Integration Extends Automation

With the Adaptive Cloud Fabric enabled, Netvisor ONE integrates with multiple orchestration solutions to deliver on the vision of the software-defined data center.

For example, leveraging the familiar vCenter console, a virtualization administrator or network operator 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. Similarly, organizations with OpenStack deployed can now provision compute, storage and network overlay services using the virtualized infrastructure manager (VIM) for one-touch provisioning.

Advanced Network Virtualization

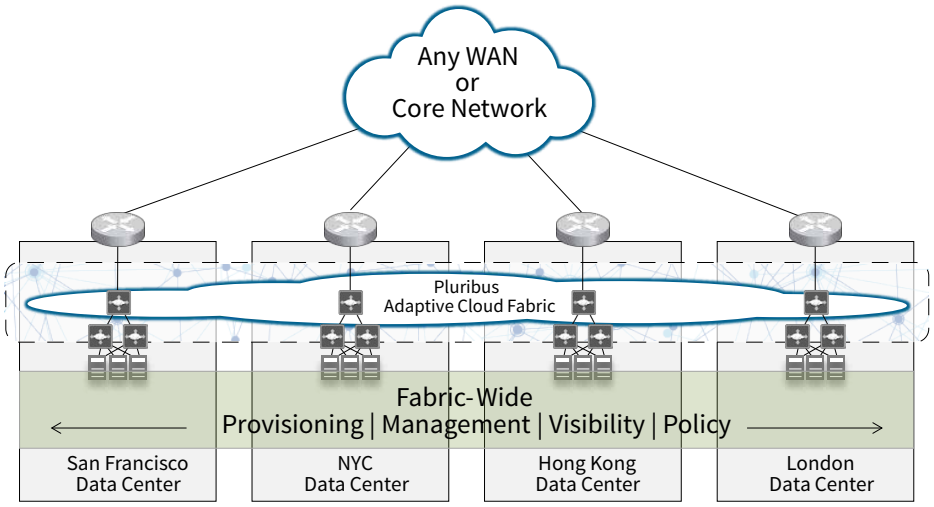
The Adaptive Cloud Fabric architecture takes advantage of the network virtualization enabled by the Netvisor ONE OS. The network virtualization overlay decouples network resources from the underlying hardware and segments the network, OS and hardware resources into containers, similar to how a hypervisor virtualizes a bare metal server. This enables a single switch to instantiate multiple virtual networks, enabling granular network segmentation, multi-tenant services, and integrated virtualized network services and functions into open switching hardware. Like a virtualized server, a virtualized network provides increased resource utilization and efficiency, improved agility due to abstraction, and security through the isolation and segmentation of traffic.

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 Adaptive Cloud Fabric enabling exceptional operational agility.

Distributed Architecture Enables a Multi-site Data Center Fabric

The Adaptive Cloud Fabric can seamlessly interconnect dozens of geographically distributed data centers or campus aggregation points over any existing Layer 2 or Layer 3 core, underlay, WAN or dark fiber network without requiring reengineering or proprietary protocols. Open networking switches combined with Netvisor ONE and ACF can either run at the border leaf location to provide data center interonnect (DCI) or they can be deployed throughout the data center leaf layer to provide a multi-site data center fabric. This ability to unify and completely automate networking across multiple data center locations, including edge data centers, is a unique capability of ACF and cannot be matched by controller-based SDN underlay and overlay solutions.

The Pluribus Multi-site Data Center Fabric solution leverages sophisticated VXLAN-based Layer 2, Layer 3 and even Layer 1 VirtualWire overlay services to achieve transparent inter-site communication with dynamic end-point tracking over existing networks. The stretched fabric provides a single-point-of-management and delivers fabric-wide resiliency with sub-second failover for virtually any failure scenario. This highly available architecture is optimized to support mission-critical environments requiring stringent loss-less high availability.



The Adaptive Cloud Fabric can seamlessly interconnect distributed data centers over any existing WAN or Network

Distributed Fabric-Wide Intelligence

Netvisor Virtual Port (vPort) technology distributes intelligence and control to all connected end-points, VMs, containers and mobile devices across the global fabric. Each vPort is associated with an end-point MAC address and is auto-learned by all fabric member switches. The dynamic vPort database is the cornerstone of the intelligent forwarding and security capabilities of the Adaptive Cloud Fabric providing a persistent, distributed end-point directory and activity history for the entire fabric.

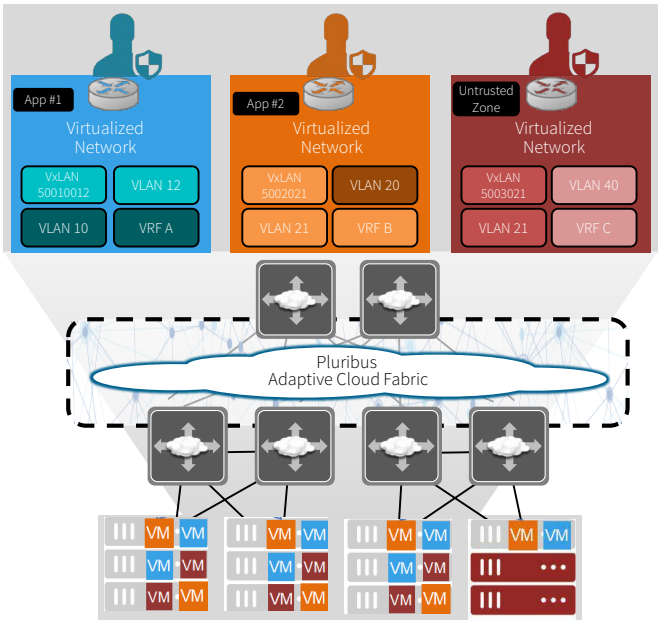
The vPort database tracks the location, identity, policy and history for each end-point, and dynamically shares state status to all fabric member devices in real-time, eliminating network broadcasts. This assures that movements are legitimate, replacing less-than-optimal "flood and learn" approaches with more efficient conversational forwarding. When mobile end-points, VMs or containers move from one port to another, even across data centers, end-point re-registration updates automatically in the vPort database in near real-time.

Secure Segmentation and Multi-Tenancy

The Netvisor ONE OS enables the creation of independent, virtual networks, called vNETs. Different than a traditional VLAN, vNETs are instantiated in containers with separate resource management spaces and policies that are completely isolated from each other.

vNETs are designed to meet virtually any security requirement and are ideal for north/south and east/west traffic segmentation or strict multi-tenant services. Each vNET functions like a separate physical switch, with its own control, data and management plane.

A specific vNET can be located on a single switch or replicated on multiple physical switches located anywhere across the fabric. There is no limit to the number of vNETs that can be created within a fabric, and because vNETs are not VLANs, network administrators can make use of all 4,000 VLAN IDs per vNET tenant.



The Netvisor OS enables the creation of independent, virtualized network containers

Since the Adaptive Cloud Fabric operates as one unified entity, vNET segments can be distributed across a global fabric, enabling strict segmentation across a virtualized multi-site overlay network. Network virtualization ensures that each segment or tenant maintains complete isolation from other segments or tenants, and the public underlay across a distributed fabric. In addition, each tenant is managed independently so each vNET can limit access to only a subset of Netvisor ONE resources or policies relating to members of a specific vNET.

Anycast Gateway for L3 VPN

The Adaptive Cloud Fabric supports Anycast Gateway, enabling endpoints to use the same virtual MAC and IP gateway addresses on all leaf switches to support seamless endpoint mobility and increase routing efficiency. This allows performing the Layer 3 gateway function for data center endpoints directly on the first hop switch to enable more scalable and efficient routing without unnecessarily increasing the control plane impacts on the switch CPU.

Scale Hyper-Converged Infrastructure Deployments

The Adaptive Cloud Fabric provides an ideal network foundation to stretch Hyper-Converged Infrastructure (HCI) deployments, such as Nutanix, VxRail, and VMware vSAN across multiple active-active data center locations. The Adaptive Cloud Fabric architecture enables resilient, high-performance interconnection across HCI nodes for reliable, distributed, and high-performance data replication, resource sharing, and workload mobility. Capacity is elastic and can scale from several nodes to hundreds of nodes with linear performance. ACF enables seamless synchronous replication between two or more data centers enabling transparent operations with complete network and compute elasticity to meet stringent active-active data protection and disaster recovery (DR) requirements. The simplicity of the Pluribus Adaptive Cloud Fabric makes the network fundamentally transparent, with cloud-like scale, elasticity and adaptability, enabling IT organizations to focus on applications and services and to speed their transition to a completely Software-Defined Data Center (SDDC).

Integrated Monitoring Telemetry

Implementing the Adaptive Cloud Fabric feature set on Netvisor ONE unlocks embedded monitoring telemetry across every switch port within the fabric to enable pervasive visibility of application and service flows without dedicated network probes.

The integrated telemetry monitors every TCP connection, including traffic within a VXLAN tunnel, across the entire fabric at the speed of the network to monitor east/west and north/south traffic flows, and virtualized workloads to expose important network and application performance characteristics.

This actionable insight provides a real-time view into end-to-end latency, duration, total bytes transferred, and the state of TCP connections, to track the dynamic behavior of network traffic. Performance metrics can be viewed via CLI, API or through the Pluribus Insight Analytics™ module within the Pluribus UNUM management platform. The metrics provided by the embedded telemetry enables the IT organization to quickly pinpoint performance issues, accelerate troubleshooting, improve operational intelligence, identify security risks, and speed remediation activities.

Network Intelligence Powers Intent-Based Networking

The integrated telemetry and distributed intelligence of Netvisor ONE tracks network and end-point service state across the Adaptive Cloud Fabric to understand how the users and services are consuming the infrastructure, and conversely how the infrastructure is supporting the users and services. Continued system enhancements will advance the depth of state-based intelligence across the fabric to dynamically compare actual versus desired state and automate corrective actions such as security or traffic policy changes, reroute traffic, and link to other systems to implement dynamic changes to the infrastructure, redefining real-time service assurance.

Network Packet Broker

A service that can be instantiated under the umbrella of the Adaptive Cloud Fabric is the Network Packet Broker (NPB), a dynamic network packet broker fabric that can be deployed to aggregate TAP and SPAN port traffic and direct it to performance and security monitoring tools. NPB is adaptive in that it is based on the same distributed and controllerless architecture, can span multiple sites and has inherent load balancing across ingress (from SPAN/TAP) and egress (to tools) links. In addition, NPB and ACF can run on the same switch, collapsing two separate networks into a single, cost-efficient production network with integrated network packet broker capabilities.

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