# Extending the SDDC Vision to the Physical Network

VMware vSphere

The VMware vSphere suite is the benchmark virtualization suite in enterprise today. Through new product features and acquisitions, vSphere has evolved from simply virtualizing compute resources into a full suite to cover the entire stack: compute, storage, network, monitoring and security. In doing so, VMware customers now can realize CapEx and OpEx savings in most areas by implementing the software-defined data center (SDDC) model, where hardware is abstracted and software defines all aspects of the virtualization platform. However, one area remains largely untouched: the switching/routing data center network fabric that stitches compute, storage and overlay virtual networks together.

Cumulus Networks has a solution for this problem: Cumulus Linux.

The vSphere hypervisor platform enables data center architects to use industry-standard server hardware and still provide high availability and disaster recovery functions that come with top tier hardware platforms. The use of a hypervisor ensures that applications can be fully portable on top of commodity servers; in the event a system failure, a workload can be moved to another rack or row within the data center.

vSphere enables server consolidation and centralized provisioning, management and patching, which saves hardware and operational costs. Virtualization offers new and better ways to secure applications and networks.
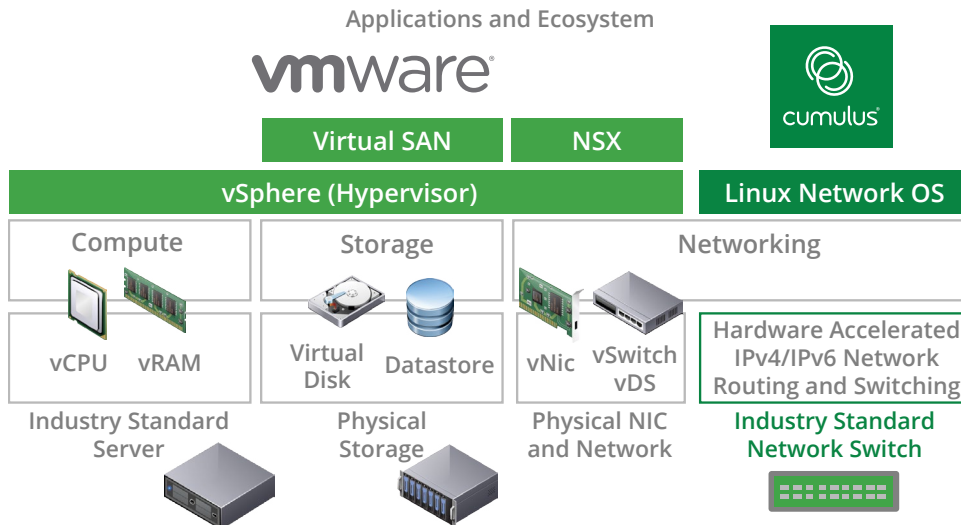
Cumulus Linux

Cumulus Linux is the first true native Linux operating system built on the disruptive model of disaggregating, or separating, software from the underlying network hardware. Through the disaggregated networking approach, Cumulus Linux provides customers with choice of hardware, choice of operating system and choice of applications built by a community of partners and customers as part of the growing ecosystem.

Cumulus Linux features not only enable the design of robust, scale-out L3 architectures, but also accommodate customers with networks based on predominantly L2 designs to migrate and reap the benefits of the modern data center fabric. As a certified partner for the ToR gateway and centralizing physical and virtual workloads, Cumulus Networks already integrates well with VMware NSX. Now, by integrating vSphere with Cumulus Linux, VMware users can now build a framework based on open networking and radically simplifying the lifecycle of management and orchestration.

Solution

With a disaggregated hardware/software model, both VMware and Cumulus Networks have been able to create simple patterns for managing these environments. In the VMware server environment, the Software Defined Datacenter (SDDC) is an approach that allows an architect to model all of the services and rules that are currently deployed in their traditional physical data center. Once these software models are built, an entire virtual data center can be cloned, moved, expanded, and more, all without any changes to the physical environment. In addition, with the advent of multi-tenancy, datacenters can be created for a single business unit or application to ensure micro-segmentation and strict access control.

As an example, a vSphere cluster of ESXi hosts needs to be presented with the same network connection (including 802.1q trunk characteristics) to ensure that workloads can be moved with no noticeable change to the application. In a VMware vSphere environment, a template defines what resources a VM should get when it is powered on. The underlying physical host has an equivalent template, known as a host profile, which defines what options and settings the host should apply when it boots. The vSphere host profile feature contains settings such as NIC bonding preference, Layer 2 load balancing algorithms, port group assignments, and virtual switch settings.

Cumulus Linux allows network architects to build templates for the underlying physical network so that a new racks can be deployed to be immediately configured and optimized. This immediately increases the speed at which you can deploy new networks, change key variables as needed in a template, and you can start powering on an entirely new network without interacting with a CLI.

Today many vSphere implementations are using a legacy Layer 2 networking model. While the market is rapidly moving to more scalable Layer 3 designs, Cumulus Linux is introducing features to support network virtualization constructs within vSphere, ESX and vCenter that require traditional Layer 2 networks. The figures show the different topologies for the Enterprise/SMB environments.
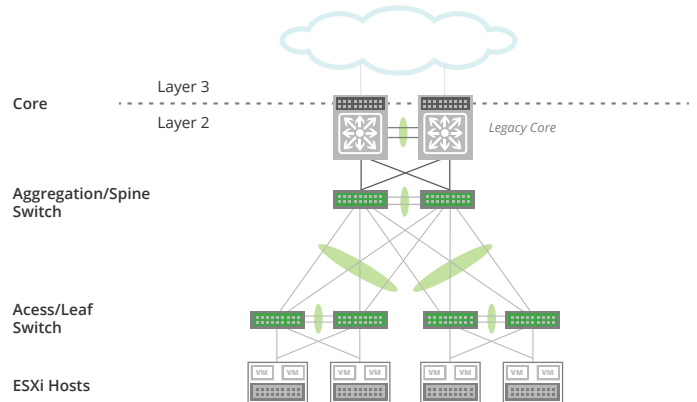
Enterprise Network POD Design

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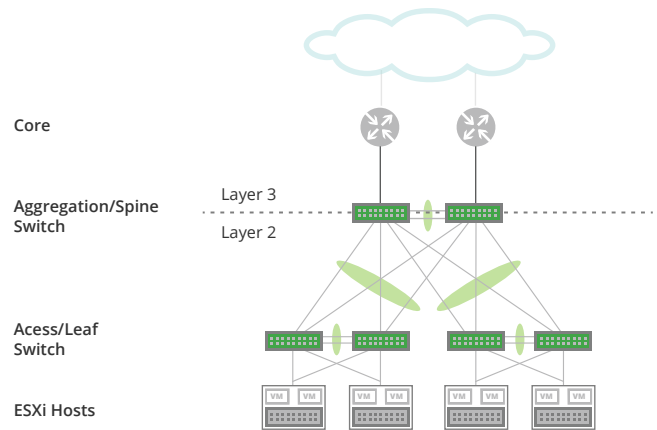
SMB POD Design

Business Benefits

■ **Shared Customer Vision:** Providing customers an environment built on distributed intelligence in software increases the rate of innovation and is the philosophy shared by VMware and Cumulus Networks. Software abstraction from hardware provides both the flexibility and best price-performance for added capacity and new deployments. vSphere ESXi hosts are homogeneous, to allow for VM mobility and follow the same philosophy of abstracting complexity.

■ **Accelerated Rollout:** Workload mobility for rapid application delivery is a key requirement for VMware users, and Cumulus Linux-powered network infrastructure acts as an enabler through several features and innovations, driving application scale and growth derived through hardware and location independence. The support for existing server deployment tools and the ability to provision entire racks of vSphere ESXi hosts through a unified management interface is a key benefit derived from the solution.

■ **Operational Efficiency through Automation:** The speed at which you can deploy new networks, by using standard open source protocols such as ONIE, zero touch provisioning/bash, and your choice of DevOps orchestration tools (Ansible, CFEngine, Chef, Puppet or Salt) helps simplify the networking environment needed for data center migrations.

Technical Benefits

- **High Availability:** Support for features such as Host-MLAG for existing L2 environments eliminates the traditional bottlenecks experienced during deployments. Dual home, dual path networks are being addressed by innovative Cumulus Networks features, which leverage existing Linux drivers and application components to increase the resiliency of L2 networks.

- **Faster Recovery:** BFD (Bidirectional Forwarding Detection) provides failure detection. Coupled with non-blocking fabric design elements like ECMP and unnumbered OSPF, and addressing network management complexity with PTM (Prescriptive Topology Manager), provides for smarter troubleshooting and recovery for data center operators.

- **Design Simplicity:** Several enhancements such as virtual counters for deeper visibility, improvements to the Quagga stack for update groups, dynamic neighbors and others add robustness to data center solutions. The ease of using shell or Python scripts and remote configuration enables network automation, just like any other Linux server. In case of failure, the secondary NameNode is accessible from the rest of the cluster with little to no loss of bandwidth. You can again leverage the PTM daemon in Cumulus Linux to extract a rack awareness topology through a simple script for the NameNode.

Conclusion

- **Open Networking Hardware :** The hardware abstraction allows applications to be quickly deployed, highly available and at scale while not incurring huge premiums associated with proprietary hardware.

- **Single Pane of Management :** Rich, unified automation tools provide ubiquity and centralized management due to the native Linux interfaces within Cumulus Linux for virtual and physical networks.

- **Faster Transitions :** Through the software-defined data center approach, we are able to accelerate the feature velocity of Cumulus Linux for faster transition to production deployments with modern data center architectures.

Get Started!

- **Try out Cumulus Linux on the Cumulus Workbench:**
  http://cumulusnetworks.com/cumulus-workbench/

- **Download the latest version of Cumulus Linux:**
  http://cumulusnetworks.com/downloads/

About Cumulus Networks®

Cumulus Networks is bringing the Linux revolution to networking. Founded by veteran networking engineers from Cisco and VMware, Cumulus Networks makes the first Linux operating system for networking hardware and fills a critical gap in realizing the true promise of a software-defined data center. For more information visit **cumulusnetworks.com** or follow us on Twitter **@cumulusnetworks**.

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VMware is the industry-leading virtualization software company. Our technologies simplify IT complexity and streamline operations, helping businesses become more agile, efficient and profitable. By virtualizing infrastructure from the data center to the cloud to mobile devices — we enable IT. Visit **www.vmware.com**.