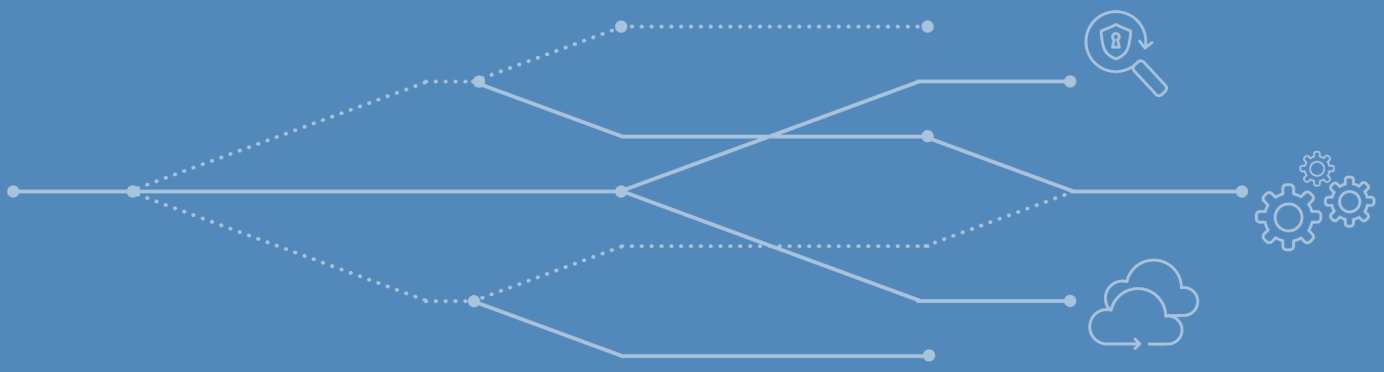


Addressing Midsize Enterprise Data Center Challenges

Applying Cloud-style Networking Architecture to Accelerate Agility and Reduce Cost

Midsize Enterprise: Data Center Challenges

Midsize enterprises (MSEs) need networking technologies that are right-sized for their needs, easy to deploy, and easily integrated with their private cloud stacks. While common to all customers, these requirements take on special importance for smaller IT organizations that lack the bench strength of layers of trained networking experts. For further details, please refer to Gartner's 2018 IT infrastructure report titled, "What Midsize Enterprises Want from Their IT Vendors."

Meeting mid-market needs might seem straightforward, but all too often networking vendors expect products engineered for the Global 2000 to work just as well for smaller data centers. Many networking products designed for large environments come with proprietary architectures, as well as the need for professional services, complex protocols, and product add-ons that raise both cost and complexity barriers. While switches may appear similar across the vendor community, hardware choices can cascade into complexities at a system level. For instance, some hardware may require operations training or specialized engineering skills to master the CLI, to integrate by API or scripts, or to install, upgrade, and correctly cable the topology. On the other hand, many lower end switching products lack the failover, resiliency, hitless hitless upgrading, automation, and analytics features required for true data center-class networking.

ARISTA

Arista —a leader in cloud networking and in network software innovations—takes a differentiated cloud-style approach, offering the networking best practices of operational simplicity, speed of change management and deep visibility, attributes that are well-suited for midsize companies. In addition, cloud-style networking has scale-out property, allowing as small as one rack and easily expand by adding more racks without adding operational complexity, thus allowing a fast-growth organization to rapidly expand its network.

IT organizations in MSEs derive significant benefits from cloud-style networking, such as eliminating most data center networking complexity without suffering any trade-offs in bandwidth, latency, control, integration with other infrastructure technologies. Moreover, Arista's converged cloud-driven solution offers a common, automated user experience for adding, moving, deleting, or updating the tenant networks at a workload level (virtual machine or application).

While one size does not fit all, midsize enterprises generally share these characteristics:

- Annual revenue that ranges from $100 million to several billion dollars
- IT staff that ranges from tens to a few hundred employees
- Networking staff that represents between 10% to 15% of the overall IT staff, responsible for campus, data centers, and wide area interconnects
- Strong interest in early-mover advantages, such as cloud, to compete with larger companies
- Innovation in the areas of edge computing and IoT, related to the industries with high concentrations of MSEs, such as retail, healthcare, distribution, transportation, and other vertical industries
- IT organizations that work at a solution level, where servers, network, and storage are managed together by one team.
- The common characteristics have led many midsize organizations toward cloud infrastructure, where silos are replaced with integrated computing, networking, and storage workflows.

Outlining Mid-Market Enterprise

Data Center Requirements

During the past decade, midsize enterprise data centers have become highly virtualized. Data center operators have consolidated the number of servers to a few racks, and they are scaling out server and storage capacity horizontally in a pay-as-you-grow model. The typical MSE customer has between several hundred servers and several thousand workloads. Many MSEs have deployed or are considering hyperconverged infrastructures (HCI) that can horizontally scale both compute and storage capacity together node by node. Many are also upgrading their edge environments for IoT, edge security, and edge analytics with additional compute and storage, for example subrack nodes of Dell VxRail or Nutanix HCI.

Most mid-market data center operators have launched multi-year initiatives to become more cloud enabled, partly for DevOps support. Many midsize IT groups want to offer their application developers infrastructure on demand—regardless of location in a data center, on the edge, or in public clouds—through a self-service provisioning portal, a convenience developers have come to expect through experience with public clouds.

Another key reason midmarket network planners prefer cloud-enabled networking: they must ensure full visibility of all workloads, whether on-premises or in public clouds. Full visibility includes inventory, cost analytics, compliance, and security control.

Finally, MSE IT groups need everything to be packaged and easily integrated. Mid-market IT groups are not interested in writing custom scripts or hiring professional service contractors to manage their networks.

Public Cloud	Cloud-style Networking
Data Center Network as a Service	**Data Center** Network as a Service
Available as Infrastructure as a Service (VPC, FlowLogs, One Console)	**Available as pre-packaged on prem and cloud software** (VPC, Orchestration, Automation Open Switches, Analytics Everywhere One Console)

Figure 1: The cloud-first networking approach

Architecting MSE Data Centers with Cloud-style Networking Principles

Architecturally, what sets Arista's Converged Cloud Fabric (CCF) apart from traditional offerings is a SDN-driven approach, where all switch operations, including installation, configuration, upgrade, orchestration, analytics, and remediation are done through a software-defined network (SDN) controller.

The Converged Cloud Fabric Controller discovers the endpoints and automatically configures the adjacent network ports, based on a set of preprogrammed endpoint policies. They include port speeds, logical segments, link aggregation policies, workload identity, and Layer -3 routing. Further, the fabric approach supports scaling out capacity horizontally with a policy-inheritance model: HCI nodes and any x86 server can be added to the rack, plugged into any switch, and configured automatically to the network.

No switch-by-switch configurations are required, no specialized protocols to configure or tune, and no rigid wiring diagrams where server and storage endpoints need to be pre-assigned (pinned to a port), and communicated to the installers.

For ease of adoption, operators can manage the controller anyway they would like including the use of the CLI, GUI, or APIs.

The business benefits are significant as capacity is added when needed—not weeks or months ahead of the need.

Moreover, network engineers are not tied up during installation, configuration, or bring up periods, again enabling speed and saving cost and time. Table 1 summarizes how the CCF software solution implements the Arista cloud-style approach to networking and compares it to the traditional networking approach.

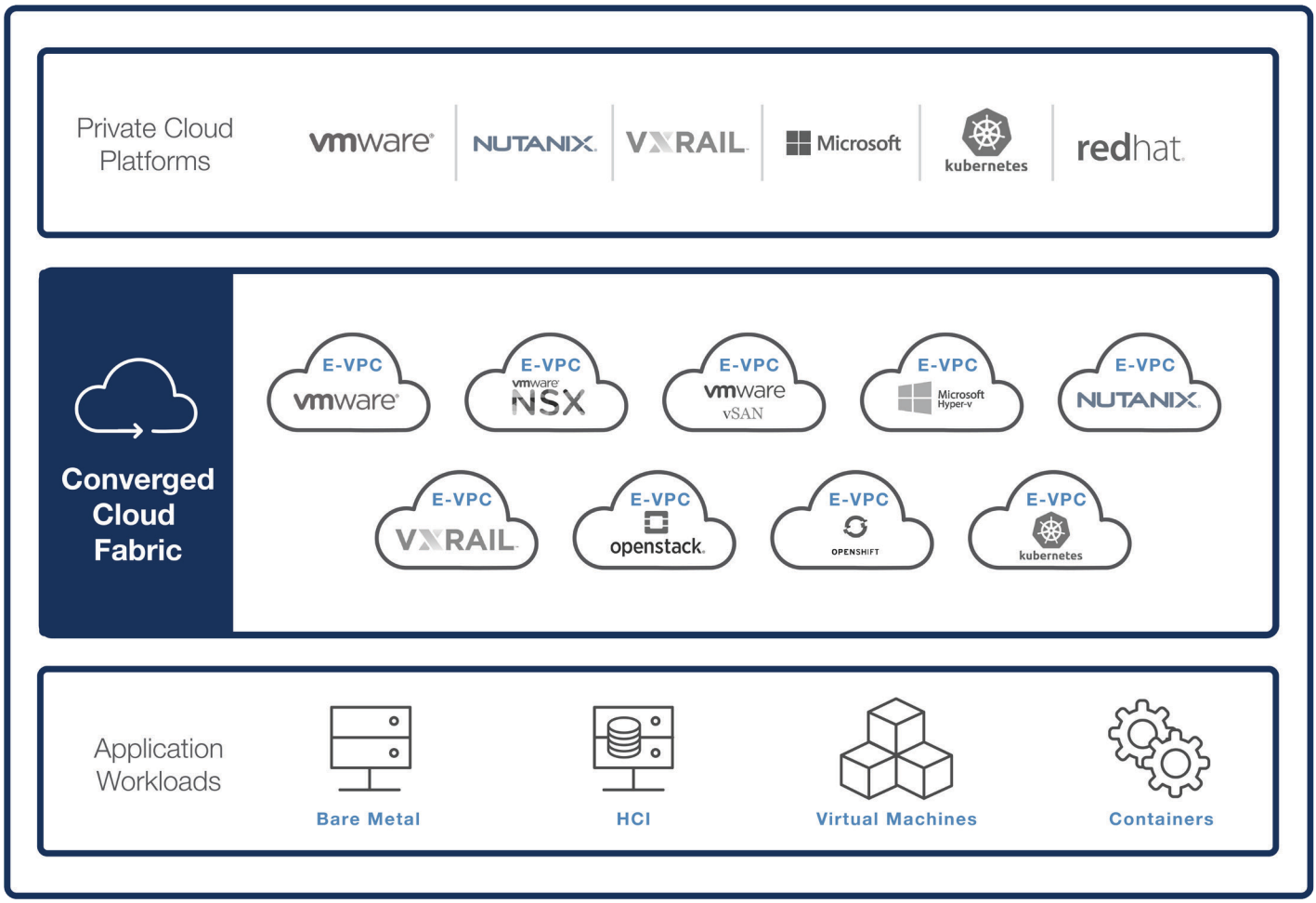
Requirements	Converged Cloud Fabric	Traditional Offerings
Architecture	SDN controller based, fabric operates as a redundant logical switch	Box by box, CLI-centric
User experience	Cloud-style VPC on-prem logical abstraction; invariant to changes to underlying physical infrastructure; can be delegated to DevOps/ CloudOps teams	Manual configurations on a Port-by-port and box-by-box basis, each with many nerd-knobs; highly error prone; very fragile to changes in the infrastructure
Bandwidth and performance	1/10/25/40/100 Gbps wire-rate port options	1/10/25/40/100 Gbps wire-rate port options
Network Automation for Private Cloud Platforms	API driven, with prepack Nutanix, VxRail, Kubernetes	Script driven, with deep network and DevOps expertise required; script lifecycle management a must
Scale-out capacity approach	Clos based, 1RU and 2RU form factors, scale as you grow	Clos based, chassis-centric with expensive line cards
Operations management	Fully automated Day 0, Day 1, and Day 2 installation, upgrade, patch, analytics, and configuration tasks	Partially automated, with additional licensed software and add-on tools required
Expertise required	Generalists, Converged team can operate (treated as an interconnect for HCI, SDDC and containers)	Network specialists needed even for mundane tasks such as VLAN and MLAG configurations

Table 1: Comparing Traditional and Converged Cloud Fabric Responses to Networking Requirements

Understanding Cloud-style Principles

Let us now review the cloud-style principles to understand how the architecture delivers the benefits agility, visibility and lower TCO for midsize enterprises.

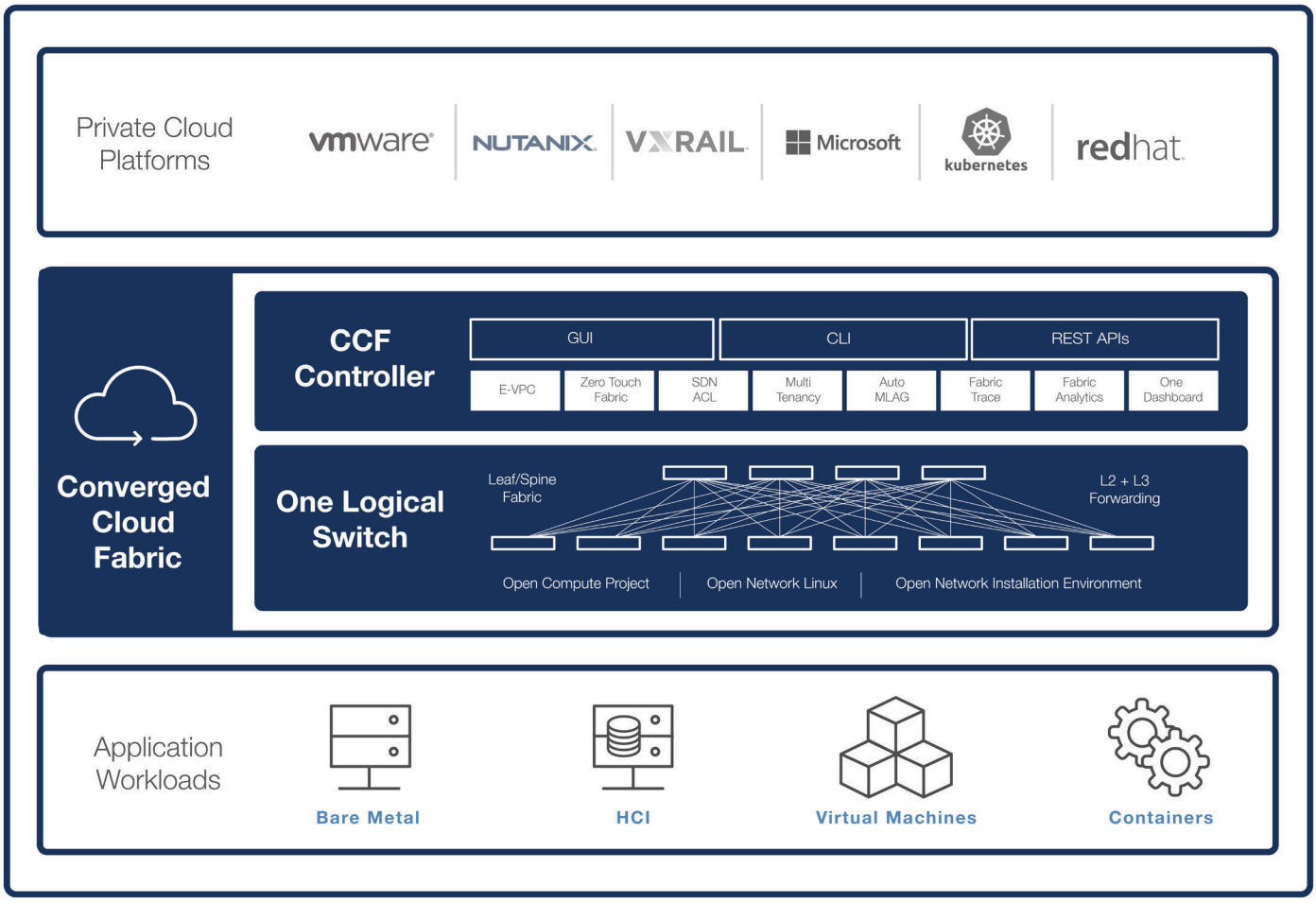
Network Abstractions



Network abstraction allows for logical isolated segments defined as virtual private clouds (VPCs) with a set of services defined within them, including security, quality of service (QoS) and IP addressing. A universal logical network segmentation language enables better collaboration among team members. Specifically, midsize enterprises can offer self-provisioning VPC services to their tenants (end users). Moreover, common VPC definition enables unified management of security, compliance, and connectivity policy.

The Converged Cloud Fabric offering provides native support for on-premises VPCs through integration into private cloud platforms such as VMware (vSphere, NSX, vSAN), Nutanix (Prism, ACH), Dell EMC VxRail, Microsoft Hyper-V and Kubernetes.

Scale-Out Architecture



A scale-out design makes it possible for the network to easily expand by adding compute and storage resources. Most MSEs increase computing capacity by adding a few nodes, up to one rack at a time. The Converged Cloud Fabric supports non-blocking, leaf-spine designs that easily accommodates speedy addition of more capacity. By contrast, in multi-tier access/aggregation/core architecture, networks are complex to deploy and complex to scale out.

GUI-driven Single Dashboard

Cloud-style networking offers ease of network management in two ways: First, through the automation of repetitive daily events such as software upgrades, patches, minor outage reporting, and troubleshooting. Second, through cleverly designed and hyper convenient control panels for the teams that monitor and manage the network.

Automating routine monitoring and maintenance is imperative for MSEs, which typically lack a large staff and large budget for handling the mundane yet vital tasks. The public cloud companies recognized this early on and designed their own easy to use Day-0-to-Day-2 management tools. The CCF Controller architecture makes it possible to automate many routine tasks, including upgrades, patches, inventory, and compliance reporting. The CCF automation increases network uptime, better protects against security holes, and minimizes the staffing required. The embedded controller GUI, which customers describe as the best in the market, makes managing complex networks easy enough for generalist IT staff, and easy enough for DevOps to largely manage for themselves the network resources set aside for app development.

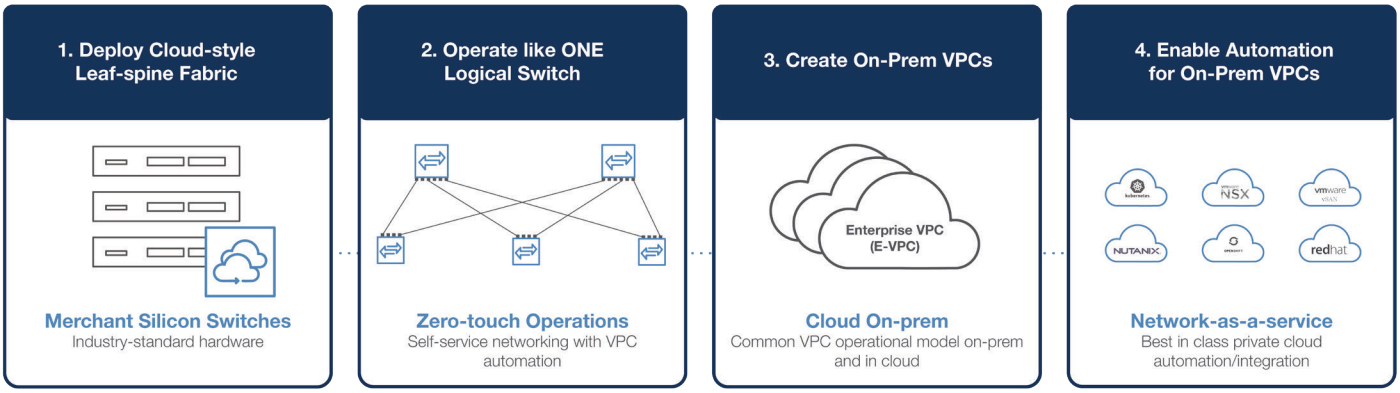


Figure 2: Converged Cloud Fabric: Cloud principles for on-premises infrastructures

Zero-touch Operations

Network teams managing on-premise data centers are burdened by operations that are slow, complex and are unable to keep up with 24x7 uptime requirements. After all, the networking scope of each box is fairly narrow with cumbersome troubleshooting.

CCF's Zero Touch SDN-based capabilities simplifies Day0/Day1/Day2 operations and provides actionable intelligence to NetOps/DevOps/CloudOps teams for rapid root cause analysis & troubleshooting. With a controller-based architecture, analytics can utilize server-level resources to support advanced functions like rapid root-cause analysis, proactive capacity management and provide contextual insights for the network.

Self-Service Networking with VPC Automation

CCF empowers application teams with self-service experience for on-prem data centers as offered in public cloud.

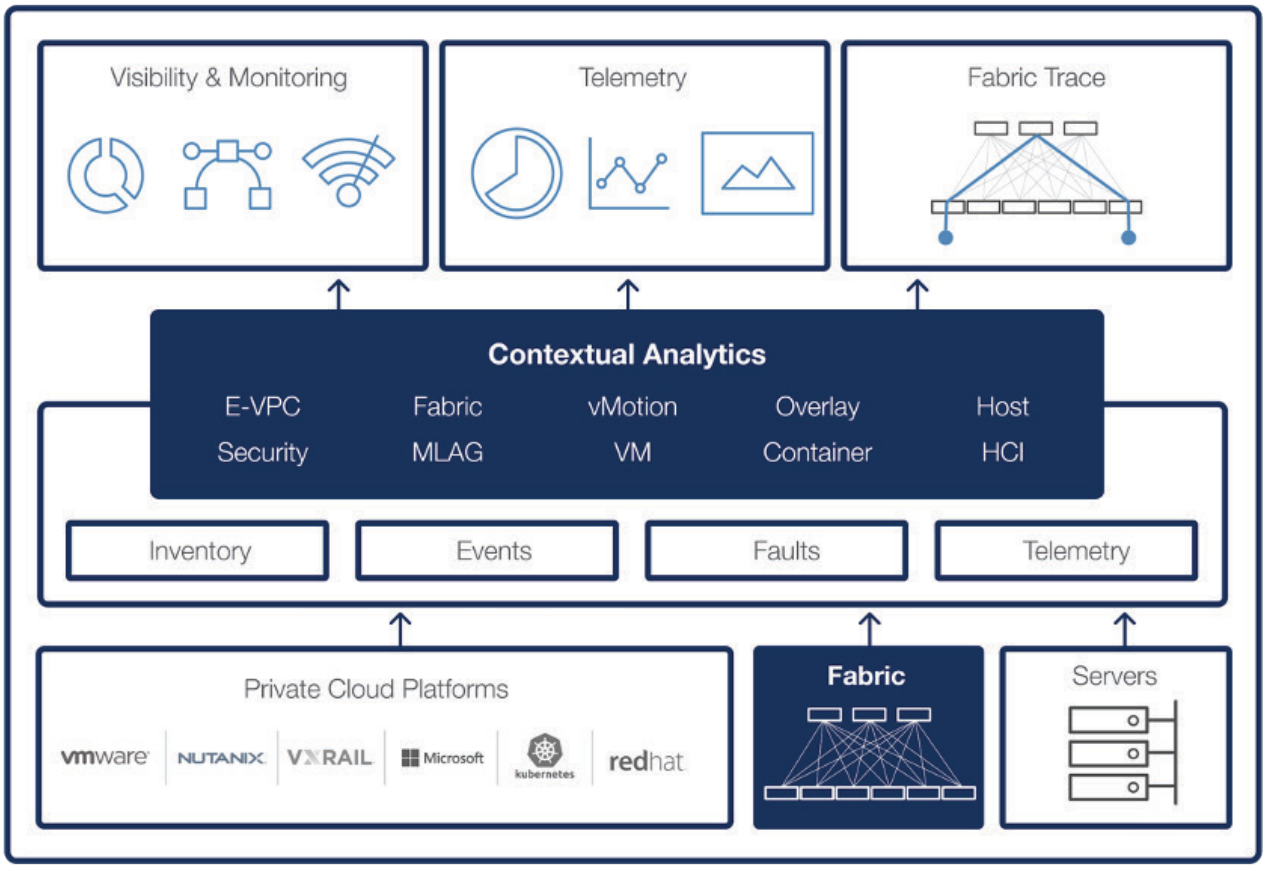
CCF's Enterprise VPCs (E-VPC) was inspired by public cloud providers' implementation of virtual private clouds (VPCs/ VNets) for underlay network abstraction allowing rapid VM and container deployments using a logical network abstraction. E-VPC simplifies on-prem networking by expressing networking rules within the E-VPC and alleviates provisioning dependency of network hardware constructs (ports, VLANs, VRFs).

The CCF solution offers a number of prepackaged plug-ins, including those for VMware (ESX, NSX, vSAN, VxRail), Nutanix Acropolis Hypervisor (AHV), Kubernetes, and OpenStack that enable orchestration use cases.

By transitioning to a logical network architecture built around externalized software control, the enterprises can accomplish cloud-style self-service networking -- a critical piece of the digital transformation journey.

Built-in Visibility and Analytics

CCF does away with the complexity of traditional network stacks by implementing one logical switch that oversees a modular, pod- based architecture built around a scale-out, leaf-spine fabric. At the same time, CCF provides built-in analytics, telemetry, real-time contextual visibility and one-click troubleshooting workflows across end-to-end fabrics.



Customer Example 1: Midsize Life and Health Care Provider

A midsize life and health insurance company chose Converged Cloud Fabric for its new data center as it had experienced many operational issues with an older chassis-based architecture with an end of row, long optical cable network design. It took weeks to add server capacity as everything was complicated, including cabling, wiring diagrams, and configurations. All of these tasks were labor intensive and required very specialized expertise.

To overcome these issues, they designed the data center with an SDN-based leaf-spine architecture, where they could purchase their compute, network, and storage devices from one vendor, under the same support contract. This was a big departure from the older proprietary design, where networking decisions were done in isolation from the other teams. Dell became the company's trusted advisor, as Dell is one of the few vendors that design and manufacture compute, network, and storage hardware.

From a network software infrastructure perspective, the company decided to conduct a proof of concept with Converged Cloud Fabric, as the evaluators liked the operation-automation features. This decision was backed by the fact that both Microsoft and Verizon had successfully deployed CCF. The CCF proof of concept only took a matter of days for a 2-rack configuration (2 spine and 4 leaf switches). Based on this success, the company decided to deploy CCF in production in the data center. This became the de facto standard as the network team added racks and pods.

The team now manages 10 racks. Adding new capacity is easy and can be done within hours, whether it is compute, storage, or networking. The network team very much likes the auto install, auto image, and auto configuration capabilities within CCF. At a broader system level, the company experiences benefits that were never anticipated, and as a result, the network operators are beginning to think out of the box in terms of what they can do next.

The first benefit comes from the graphic user interface in the CCF Controller: faster workflows in resolving endpoint connectivity issues, especially when compared to traditional CLI trace-and-ping approach. The team no longer needs a network specialist to resolve every endpoint issue. The specialist can engineer this workflow into broader remediation workflows. Even more compelling, the network team shares the controller APIs with the DevOps team, collaborating on the VPC tenant configuration settings that DevOps would like to automate. That collaboration was impossible with the company's older box-by-box CLI approach that required scripting far too complicated to hand off to the developer team. Both benefits help the team to act like network developers, not network administrators, and they are now thinking about ways to better streamline IT.

Customer Example 2: Midsize Financial Services Company

A midsize financial service company chose Converged Cloud Fabric for its active secondary data center, which required full transaction redundancy for backup and data-protection requirements. The company chose CCF partly because the secondary site was also the site for application development, based upon a VMware ESX and NSX infrastructure.

With these two requirements in mind, the members of the project team wanted to ensure they could easily orchestrate the addition of new tenants and applications without having to manually configure VLANs within the physical network, and to have these isolated from any production traffic coming into the secondary site as real-time transaction data. Mandatory requirements included throughput, latency, isolation, security, automation, and orchestration with VMware technologies.

CCF was the ideal solution as it offered an out-of-the-box plug-in with both vCenter and NSX Manager: any port group or VXLAN configured within the virtualized infrastructure would be configured within the top-of-rack network underlay switch fabric. Moreover, the evaluators liked that they could easily trace the connectivity of the virtual machines through the NSX and CCF topologies with one integrated view in the CCF Controller GUI. They also liked that the configurations were fully automated through their DevOps portal.

The business reaped significant benefits from the Arista solution. The company cost effectively set up a secondary active data center, within a managed-service colocation facility, with both physical and cybersecurity protection at wire rate. The organization leveraged this second site, with extra capacity for DevOps, without impacting or creating operational overhead.

The network team automated the logical tenant segments to the point that the engineer, who had done the tenant provisioning manually in the past, could start working on the next generation network analytics project.

Customer Example 3: Midsize Autonomous Driving Company

A midsize autonomous driving company chose Converged Cloud Fabric for its Silicon Valley R&D center because it needed a network infrastructure that was highly flexible and could easily scale with increased size and velocity of data streaming in from a growing fleet of electric cars. As not many on the developer team were familiar with networking, the planners knew that a box-by-box CLI approach would end up creating a bottleneck that would stifle agility, as well as the scalability of the infrastructure to respond to petabytes of data streaming in from each car.

This company tested several traditional solutions and decided on CCF for the automation required for the DevOps team and for integration and orchestration with Kubernetes. The company realized that the CCF Controller architecture was the best approach for those requirements. Moreover, the planners knew that as the company started selling more cars they would need to scale out server capacity quickly. They liked the fact that CCF provides automation for physical switches—once cabled into the rack—these switches could be auto imaged and auto configured. Moreover, the network planners appreciated that CCF automatically configures the complex topology protocols, including the Layer 3 routing, traffic balancing, and failover.

This midsize company successfully deployed CCF in data centers in the US and Asia and has been very satisfied: CCF has met all of the objectives. Recently the pace of the company's global electric car sales has picked up; the amount of road condition, car conditions, weather conditions, and other data coming into the data center from the cars is also growing exponentially, well beyond the initial estimates.

The good news is that the company can meet the networking demands with the CCF scale-out architecture. The network team can also securely grant DevOps access to this data through the Kubernetes, CCF orchestrator plug-in. The CCF network operates at the speed of containers and data ingestion.

Summing up:

The capabilities of the Arista offerings described in this brief address the requirements of the midsize enterprise market, as highlighted by Gartner.

In short, the Converged Cloud Fabric offering provides the following:

- Removes protocol and design complexities through VPC abstractions
- Extends networking out to non-networking professionals through the use of VPCs
- Lowers the price points by providing vendor choice
- Reduces the cost to integrate with other private cloud platforms via automation (through API integration)
- Scales linearly as needed with a leaf-spine fabric approach
- Reduces daily operations cost by the automation of many upgrade, configuration, and alerting tasks
- Offers integrated traffic and topology analytics for fine tuning, troubleshooting, and reporting
- It offers a common cloud-style abstraction and user interface for workloads running on premises across data-centers

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