Magic Quadrant for Data Center Networking

Published: 03 July 2017   **ID:** G00309507
Analyst(s): Danilo Ciscato, Mark Fabbi, Andrew Lerner

Summary

Network solutions for enterprise data centers are evolving to support better agility and cloud architectures. Enterprise I&O leaders should evaluate multiple vendors, and focus on comparing architectures, software features and infrastructure integration capabilities, not hardware specifications.

Market Definition/Description

The data center networking solutions covered in this research are hardware and/or software solutions to deliver connectivity within enterprise data centers. Network technology solutions include data center core/spine switches, server access switches (top of rack [ToR], leaf), virtual switching, programmable Ethernet fabrics, network automation, network overlays and emerging approaches, based on disaggregation of hardware from software and open-source components.

The data center network historically was just a fast and scalable LAN to connect all data center equipment. Today, with the increased adoption of cloud computing models and in support of digital business initiatives, enterprises need better integration and orchestration of the network with the rest of the data center infrastructure (storage and compute). In addition to the highest levels of performance and high-speed Ethernet ports (10/25/50/100GbE), data center network equipment must support automation, programmability and analytics for application performance monitoring and troubleshooting.

> We envision that functionality for building a hybrid cloud, through seamless integration of enterprise-owned network solutions with public cloud services, will play an increasing role in vendor selection by 2020.

This research evaluates data center switching solutions for enterprises that procure and manage their own data center infrastructure, for installation within their premises or in colocation facilities. While public cloud providers and hyperscale data centers are also large consumers of data center switching solutions, their buying criteria and

requirements significantly differ and are not considered in this research. The data center LAN market is now clearly differentiated from campus LANs, which include wired and wireless access infrastructure, covered in "Magic Quadrant for the Wired and Wireless LAN Access Infrastructure."

Market Dynamics

The enterprise data center networking market in 2016 grew by 13% in revenue (see "Market Share: Enterprise Network Equipment by Market Segment, Worldwide, 4Q16 and 2016"). 10GbE was the most common connection for servers, and the average cost of a 10GbE port declined by 22% (from $214 to $165). The 40GbE segment experienced strong revenue growth (71%) in 2016, but we expect this growth to shift to 50GbE and 100GbE in 2017, which will quickly replace 40GbE for new purchases.

This market is mostly driven by:

Replacement of existing data center switches that are becoming obsolete

Expansion of network infrastructure to support new applications/services

Adoption of new solutions to increase agility, ease of operations and cost-effectiveness of existing infrastructure

Simultaneously, this market is being impacted as some organizations desire to shrink their on-site infrastructure, by moving variable portions of their workloads to colocation facilities or public cloud.

Along these lines, the common topics that data center networking clients have raised in the past year include:

What is the status of software-defined networking (SDN)? Should I consider SDN?

What commercial solutions (including programmable fabrics and overlays) can increase automation and agility? (Most questions were regarding Cisco ACI and VMware NSX.)

What vendors are best-aligned with future requirements?

How do the different commercial solutions compare?

What network solutions will facilitate the implementation of a hybrid cloud?

Is my proposed purchase competitive from a pricing perspective?

Are hardware/software disaggregation and open source relevant for the enterprise?

Clients focus on pragmatic deployments of automated fabrics, with purchases usually triggered by the need to replace obsolete equipment and deploy 10GbE (or, increasingly, 25GbE) for server attachment. They are interested in basic fabric solutions (SDN-based or traditional), including virtual network overlays that can be deployed incrementally when a hardware refresh is not planned.

Data center networking equipment is business-critical and has a long life cycle (typically four to seven years), so buyers are strongly influenced by historical vendor relationships, experiences with the quality of their support and technical familiarity with previously installed products. Uptake of more innovative solutions is relatively slow, with risk adversity, skill sets, and cultural or organizational barriers being the biggest inhibitors.

Although the need to contain cost is frequently mentioned, price is not the main driver for most enterprise buyers, for both equipment and support, and the availability of lower-cost alternatives is often not enough to trigger a supplier change.

What's Changed?

What is driving change in data center infrastructures is the need for improved operational agility, a key requirement as clients go through the digital transformation of their businesses. Vendors are evolving the features of their solutions in response to this pressure, but the biggest changes since the previous edition of this Magic Quadrant are related to the vendor landscape. It is essential for clients to understand the strategic market position of all vendors, in addition to the technical attributes of their solutions, to ensure that they do not put themselves on a dead end.

Vendors' Landscape Evolution and Market Consolidation

The landscape of data center networking vendors is rapidly changing, with consolidation taking place among smaller players and changes in strategy for leading vendors:

Broadcom announced the intent to acquire Brocade, which has a cascading effect on this market, as Broadcom is also a supplier of chipsets to most vendors and immediately announced its intention to divest the IP Networking division.

The IP Networking division of Brocade is being split and sold in separate parts, with Extreme Networks announcing the intent to acquire Brocade's data center switching, routing, automation and analytics business.

Avaya filed for Chapter 11 bankruptcy protection, and as part of the restructuring, Extreme Networks made a stalking-horse bid to acquire the data networking portion of Avaya.

In 2016, Hewlett Packard Enterprise (HPE) completed the sale of 51% of its H3C subsidiary in China and this had major implications for HPE's strategies in the data center networking market. In November 2016, HPE announced a partnership with Arista Networks and a strategy to offer its customers and partners the ability to purchase Arista's switching products directly from HPE. Thus, Gartner sees HPE's long-term role in this market to be primarily a system integrator and reseller, versus a direct competitor to other vendors.

In 2016, Dell completed the acquisition of EMC, which included VMware. Dell officially stated that VMware will continue to operate completely independently. We have not seen any effect of the acquisition on the strategy and the networking portfolio of both

Dell and VMware so far, but as the joint company makes progress with operations in 2017, there might be synergies or strategy adjustments.

Other emerging technological and financial trends include:

25GbE switch ports starting to replace 10GbE for server access at similar price points

50/100GbE interswitch connections replacing 40GbE as a higher performance, efficient and cost-effective alternative

Brite box and disaggregation of hardware and software gaining some traction, as demonstrated by the inclusion in this Magic Quadrant of new vendors focused on software that meet inclusion criteria for the first time (such as Big Switch Networks and Cumulus Networks)

Streaming telemetry and application analytics becoming a key selling point for new data center networking solutions, because they provide insight that facilitates operations and will enable intent-based networking

Flexible pricing models, including pay as you go, subscription service pricing and burst capacity pricing being available, although we have not yet witnessed significant adoption in enterprise organizations

A split of hardware and software pricing in proposals, both for equipment and support (even when hardware and software must be purchased from the same vendor, such as with Cisco One; see "Verify If Cisco One Will Save You Money Before Adopting It"); this signals a vendors' mindset change and indicates that the disaggregation trend will continue

An increasing use of Internet Protocol (IP)-based storage networking, which drives more traffic to the data center network, instead of to the traditional Fibre Channel SAN

Deployment of hyperconverged integrated systems (HCISs) from vendors like Nutanix or HPE SimpliVity creates a need for their integration with network and security architectures, beyond pure connectivity

Adoption of private, public and hybrid cloud models in enterprises demanding support of network capabilities like multitenancy, segmentation, policy management and end-to-end monitoring, with solutions that can consistently span private, public and hybrid environments

Networking solutions for containers starting to appear, from the vendors covered in this research or from open-source initiatives; they will be needed as containers migrate from their current use in development environments for Mode 2 applications to production deployments over the next two years

Market Direction

The CLI Is Dead; the API Is Cool

There is an ongoing move away from using device-by-device command line interface

(CLI)-driven configurations toward a centralized and more policy-based mode of operations. We expect that, by 2020, only 30% of network operations teams will use the CLI as their primary interface, down from 85% at YE16 (see "Predicts 2017: Enterprise Networks and Network Services").

Today, most data center networking solutions come with a GUI, so adding network configurations can be done through a simpler interface and the necessary changes are then automatically applied to multiple network devices. However, the real innovation comes with the API, because it enables complete automation of repetitive tasks, but also integration with higher-level infrastructure automation tools that can leverage the network API directly, without involvement of a human network operator, at least for a subset of tasks (such as provisioning of network services to newly created virtual machines [VMs]). APIs and device-level automation tools (like Ansible, Puppet or Chef) can also be used to implement a DevOps model.

Value Continues to Shift Toward Software

While there is consensus on the increasing importance of software, there are still vendors investing in proprietary hardware (like Cisco Cloud Scale and Juniper Q5 application-specific integrated circuit [ASICs]), because they believe that developing the entire system gives them a better chance to lead in some aspects and differentiate from competitors, at least in specific use cases.

That said, most vendors are now focusing their innovation efforts on software and leveraging merchant silicon to build their switching portfolio. Many vendors are using more than one chip supplier, and we are seeing increased competition in the merchant silicon market, which offers OEMs the ability to optimize platforms based on functionality and price. This creates a need for making the software adaptable to different chipsets. While many vendors use the software drivers provided by the chipset manufacturer to simplify the task (leveraging open platforms like ONIE and SAI), others prefer to develop the entire stack to achieve better optimization and differentiate. Some chipsets can be dynamically configured for different switch usage scenarios (for example, a large MAC table versus a large routing table) or provide highly programmable frame processing (for example, with languages like P4), so users will benefit from more options and choice as vendors differentiate their solutions through software, even when using the same chipset.

Given the broad spectrum of software options, we believe that merchant-based platforms can meet the needs of at least 80% of enterprises.

Fabrics Are the New Normal

Most vendors offer fabric solutions that are based on different (and generally proprietary) architectures, but can provide similar benefits as SDN, at least in terms of programmability and centralized point of control, if not in terms of reduced vendor lock-in and cost. Examples are Cisco ACI and NFM, Arista Networks CloudVision, Juniper Networks Junos Fusion, and Huawei Cloud Fabric.

Analytics and Intent-Based Networking

All vendors are putting a great emphasis on network analytics and delivering solutions that provide increasing insight into the application data flows that are traversing the data center network. Streaming network telemetry data is a new mechanism to feed analytical tools, and scales well beyond the traditional SNMP polling of Management Information Bases (MIBs). These capabilities enable easier troubleshooting of traditional network issues, like identifying congested network interfaces that are dropping packets, but they give also infrastructure and operations (I&O) leaders a lot more information about applications and how the network is influencing the service level experienced by end users (for example, Cisco Tetration Analytics and Arista DANZ).

Analytics combined with automation capabilities are foundational to intent-based networking, a concept that represents the next frontier for vendors. With intent-based networking, high-level business policies are translated into network configuration commands and implemented through automation. Real network behavior is then compared against the desired behavior to enable any necessary remediation and ensure that the policy is actually enforced. The idea is to build a self-driving network. Just like building a self-driving car, implementation of intent-based networking systems requires data from sensors (network analytics) to feed the computation of abstract models built with complex artificial intelligence algorithms, and then actuators to operate the car (network automation through the API; see "Innovation Insight: Intent-Based Networking Systems").

Open Networking

There is a growing willingness to move away from proprietary solutions. Our end-user survey (n = 83) indicated that 42% of clients consider open standards and multivendor interoperability support a mandatory requirement, 34% consider it very important, and 20% consider it somewhat important, so openness is a relevant buying criterion for 96% of the end users.

These results are quite impressive, but in addition, 75% of the end users indicated that they expect an increase in relevance of open networking in their purchasing decisions in the next 24 months. This requirement is mostly unfulfilled by vendors, since the majority of the solutions considered in this research are proprietary; thus, it might create market opportunities for players willing to pursue this path.

Disaggregation/Brite Box

Disaggregation of hardware and software can be seen as a first step toward more vendor independence. Interest and adoption of white-/brite-box switching has increased significantly within hyperscale data centers over the past several quarters, and we expect it to reach 22% of the total data center Ethernet switch market by 2020 (see "Forecast Overview: Enterprise Network Equipment, Worldwide, 2017 Update"). Enterprise clients were inspired by hyperscale stories and asked questions on suitability for their use cases. As a consequence, we have seen enterprise adoption of brite box (the most successful delivery model in this market segment) grow, and we estimate about 1,000 paying enterprise customers as of March 2017. This includes some very large accounts in

finance and the public sector. However, established vendors (for example, HPE and Dell) did not generally lead in enterprise with solutions based on brite box and third-party software, or did that only for specific use cases like network packet brokers, so adoption of disaggregated solutions in mainstream enterprises is still limited.

HCISs

HCISs tightly couple compute, network and storage hardware in a system and are gaining popularity, since they simplify operations and improve provisioning times. The networking components of an integrated system are largely prescribed, which results in the transfer of the physical access layer network buying decision from what was solely a networking decision to an integrated server/storage/network decision. Examples are Nutanix and HPE SimpliVity.

Scaling of HCIS clusters and deployment of input/output (I/O)-intensive workloads will lead to the necessity of an end-to-end network design to achieve a more robust, cost-effective and reliable solution (see "Leverage Networking to Ensure Your Hyperconverged Integrated Systems Can Support Demanding Workloads").

Containers

Containers are a technology for running multiple workloads under the same OS kernel instead of using separate VMs, each with an OS. Container networking is at the maturity stage where VM networking was about five years ago; it is fast-evolving and fragmented, with all vendors in this research starting to provide solutions and launching initiatives. It is difficult for network architects to determine which vendors and architectures are best-suited for their usage scenarios, but at this time, containers have very limited production deployments in enterprise data centers. However, this will be an important decision in the next three years, as containers are widely used for development of Mode 2 applications that sooner or later will need to be deployed in production (see "Take [Limited] Action to Prepare Your Data Center Network for Containers").

Magic Quadrant

Figure 1. Magic Quadrant for Data Center Networking
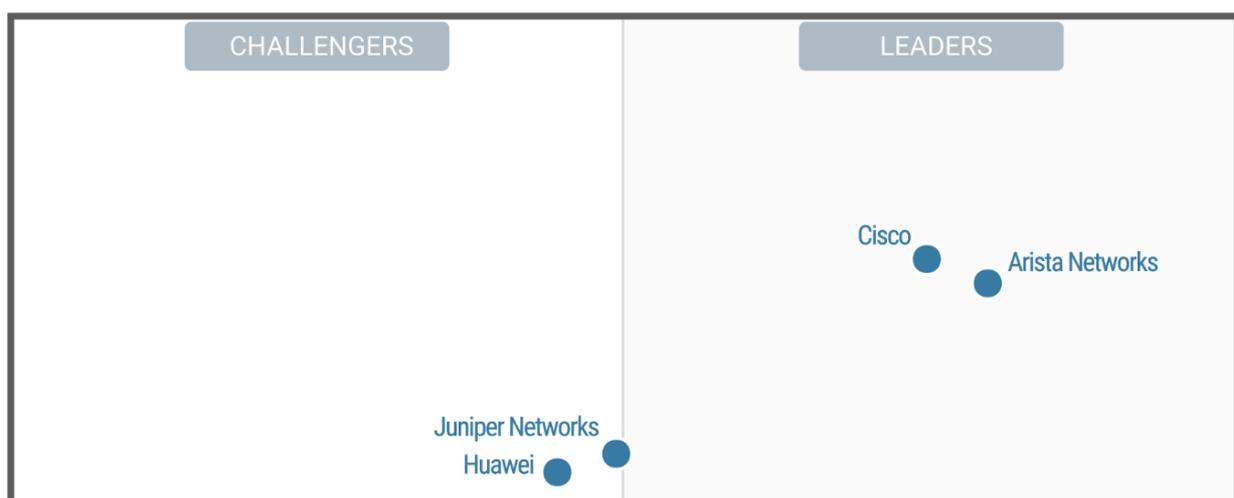
Source: Gartner (July 2017)

Vendor Strengths and Cautions

Arista Networks

Arista Networks, based in Santa Clara, California, is focused exclusively on data center networking and continues to grow above market rates, reaching a 9.8% revenue market share in 2016. Its Extensible Operating System (EOS) software is highly programmable and can be integrated with nearly all third-party cloud management and orchestration infrastructures. Arista's CloudVision provides a central point of management, facilitating integration with third-party controllers (including VMware NSX). The vendor's hardware strategy is based on leveraging merchant silicon from multiple suppliers and thus its focus is primarily on software and management, although Arista has shown an ability to deliver optimized merchant silicon-based products. Over the past year, Arista introduced support for data center interconnect (DCI) through the R-Series and announced containerized EOS for disaggregated use cases that use third-party hardware. The vendor also delivered more streaming telemetry capabilities, to improve visibility of network performance. All enterprises should consider Arista, particularly large organizations with advanced requirements that need flexible and programmable solutions. The resale partnership with HPE will help Arista increase global market coverage.

STRENGTHS

Arista offers a flexible solution that can integrate with a wide range of third-party software orchestration and SDN products, through open interfaces and programmability.

Arista provides high-performance and very scalable solutions, with deep buffers, large

address tables and low latency.

CloudVision provides networkwide centralized state (NetDB), including telemetry and application visibility capabilities, along with extensible APIs and a software development kit (SDK).

Arista offers a portfolio of products with different form factors, including some large fixed configuration switches, enabling the implementation of high-performance, very scalable and rightsized solutions for every environment.

CAUTIONS

Geographic coverage has improved in 2016 and Arista now has an installed base in 70 countries, but its main presence remains with large customers in North America and Western Europe, so enterprise clients should assess the level of local support.

Arista does not provide interfaces for converged storage networks where FC (or FCoE) is a requirement, so it is suitable for environments that use IP storage or plan to maintain separate SANs.

Arista is focused only on data center solutions, which limits its ability to extend its architectural capabilities to campus and WAN networking only through partnerships (for example, with HPE).

An ongoing legal dispute with Cisco has been a distraction for Arista management; it led to longer lead times in delivering products. The import ban in the U.S. that was temporarily introduced and then lifted represented an increased level of perceived risk for some potential customers (see Note 1).

Big Switch Networks

Big Switch Networks delivers programmable SDN solutions based on open hardware, and is headquartered in Santa Clara, California. In 2014, it released Big Cloud Fabric (BCF), a controller-driven data center networking solution based on a spine-and-leaf design that uses white-/brite-box switches. BCF is a modern data center SDN fabric that enables rapid provisioning, simplified operations through a GUI and programmability through an API. BCF can integrate with VMware NSX, but also provides a virtual switch for unified Physical+Virtual (P+V) deployments (for example, in OpenStack environments). Big Switch used its network packet broker (NPB) solution called Big Monitoring Fabric (BMF) as a Trojan horse in accounts that were not ready for a white/brite box as their primary data center network, but were open to trying the technology for a specific application (NPB). Big Switch is a contributor to open-source communities and its philosophy is to combine open-source components with its own modules to provide commercial-grade solutions. Big Switch should be considered by organizations interested in an off-the-shelf, commercial fabric solution that leverages white/brite-box hardware platforms and can scale to very large environments.

STRENGTHS

Big Switch provides a commercial cost-effective SDN fabric solution based on industry-

standard white-/brite-box hardware that is 30% to 60% less expensive than top-brand hardware, resulting in three years total cost of ownership (TCO) savings that can reach 50%.

BCF is based on a centralized controller with an intuitive GUI that provides network management and analytics through a "single pane of glass," eliminating the need to use the CLI.

Big Switch has a partnership with Red Hat to simplify the installation and management of BCF with Red Hat Enterprise Linux OpenStack Platform.

BCF can be integrated with leading cloud orchestration platforms (like VMware) to provide a highly automated network solution.

CAUTIONS

Big Switch is a small company, with a limited footprint outside of North America and limited experience in integration with complex enterprise environments with extensive legacy. However, it has channel partnerships with companies like Dell EMC and HPE to extend market coverage.

Despite being an early proponent of open SDN and OpenFlow, Big Switch uses a proprietary protocol within its BCF. Thus, third-party switches cannot be integrated into BCF.

In large multitenant environments with multiple logically isolated pods, the role-based access control (RBAC) for enabling per-tenant administrative control is limited. We anticipate that this gap will be addressed by the end of 2017.

Big Switch does not support interfaces for converged storage networks (FC or FCoE); it is suitable for environments that use IP storage.

Cisco

Cisco, based in San Jose, California, is the most visible vendor in the data center networking market and has a broad portfolio, which also includes servers, hyperconverged infrastructures, cloud management software and security. In 2016, it led the market in both switching revenue and port shipments by a vast margin (Cisco's revenue is more than five times greater than the nearest competitor), but it lost share in both areas (−3% revenue share and −6% port share quarter over quarter in 4Q16). Cisco's flagship data center networking offering is the Cisco Nexus 9000 switches running Cisco ACI software, although it also offers Nexus Fabric Manager (NFM), an alternative fabric solution, and BGP EVPN. Gartner has seen consistent adoption of these offerings over the past year, and Cisco now reports over 3,500 paying ACI customers; however, many use ACI for network automation and few use the policy-based capabilities. Over the past year, Cisco released a new hardware line of switches, based on its Cloud Scale ASIC, a move that goes against the industry trend toward merchant silicon, although the vendor continues to sell other models of switches based on merchant silicon. Cisco should be considered for all data center networking opportunities globally, particularly by those

clients that prefer to have few strategic suppliers.

STRENGTHS

Cisco has a deep and broad portfolio, global support capabilities, a large loyal installed base of customers, and channel partners that are familiar with its product portfolio.

Cisco's ACI software provides fabric automation, policy-based orchestration and service chaining capability, and supports integration with dozens of Layer 4 to Layer 7 networking partners, including Citrix, F5, Check Point and Infoblox.

Cisco is a full-stack data center infrastructure vendor, providing compute, storage and security, which is desirable for enterprises looking to reduce their number of suppliers.

Cisco supports multiple options for automation and programmability, including ACI, NFM, Puppet/Chef/Ansible/Python, OpenStack ML2 plugin, Yang, OpenConfig and RESTful APIs.

CAUTIONS

Cisco customers report that migrating from legacy infrastructures to a Cisco ACI infrastructure is complex for a variety of financial, technical and cultural reasons, and most clients have not implemented the policy-based operational concepts available within ACI.

The vendor's overall proposals are the most expensive in deals that Gartner has observed. This is reiterated in our market tracking, as Cisco's cost per 10G port ($307.40) was much higher than the market average for 2016 ($165.18).

Some clients have reported software stability issues with ACI, including bugs. Also, clients have reported issues with ACI-based microsegmentation.

Cisco currently lacks a fixed form factor ACI spine switch based on the Cloud Scale ASIC with 25/50/100GbE ports. This forces customers to make a suboptimal hardware choice when a fixed form factor ACI spine switch is desired, which Gartner believes is a good fit for most mainstream enterprises. We anticipate that the vendor will address this in 2017.

Cumulus Networks

Cumulus Networks is based in Mountain View, California and provides network operating system (NOS) software for switches. The vendor has more than 500 paying customers, and we estimate that 30% of its installed based is enterprise, with the rest being providers of services. The vendor's flagship product, Cumulus Linux, is an NOS. Cumulus Linux can be run on all hardware vendors' switches listed in the vendor's hardware compatibility lists (HCLs), which support ONIE and include Open Compute Project (OCP) designs. The vendor also offers its own complete switch (a turnkey solution called Cumulus Express), to simplify trials and adoption with clients new to disaggregation. Thus, Cumulus simultaneously competes and partners (through resale agreements) with other vendors in this research. Cumulus Linux provides native support for multiple Linux-based

automation tools, and we see most of its adoption in large-scale environments where widespread automation is mandatory. Over the past several months, the vendor has shown increased commitment to mainstream enterprise, releasing several capabilities including the hardware appliance offering, support for chassis switch and a CLI-based interface. Cumulus Networks is a fit for technologically advanced organizations that desire a Linux-based NOS that can be run on multiple industry-standard hardware platforms.

STRENGTHS

Cumulus' software provides native support for a wide range of Linux-based tools including automation software from Puppet, Chef and Ansible.

The vendor has proven experience in large-scale network environments within financial services, telecom carriers, web-scale companies and cloud providers.

Cumulus enables disaggregation of NOS from switching hardware, which can reduce capital and operational costs by 30% to 60% and more, while also reducing the potential for vendor lock-in. Cumulus supports hardware switches from Edgecore Networks, Quanta Cloud Technology (QCT), Supermicro, Penguin Computing, Agema, Dell EMC, Mellanox Technologies and HPE.

Cumulus is one of the pioneers in open networking, including being one of the first vendors to support disaggregated switching and also contributing ONIE and other intellectual property to the open-source community.

CAUTIONS

The vendor has a limited installed base and experience in mainstream enterprise networking environments, and its customer support will not be as comprehensive as with leading vendors. The majority of its customers are technologically advanced and forward-leaning, with deep automation and Linux expertise.

Cumulus acts as the first line of support for brite-box solutions; however, organizations that choose the option to acquire Cumulus Linux NOS separately from their hardware switching vendor may have to manage multiple suppliers, which can increase mean time to restore when troubleshooting issues.

Cumulus' own hardware portfolio (Cumulus Express) is limited in terms of form factor breadth.

Geographic coverage is still limited outside of North America when compared with more-established vendors.

Dell EMC

Dell EMC is a large company headquartered in Hopkinton, Massachusetts, that provides a broad range of IT products and services to enterprises and service providers, although networking represents a small portion of its overall business. After the acquisition of EMC, the combined company has continued its Open Networking strategy. The vendor

provides its own integrated hardware/software switching products, but in addition to its own software it also supports other vendors' software (for example, Big Switch Networks, Cumulus Networks, IP Infusion and Pluribus Networks) to run on its switches. As a result, Dell EMC both partners and sometimes competes with other vendors in this research. All organizations globally should consider Dell EMC, provided there is appropriate channel and sales coverage with networking skills in the region.

STRENGTHS

The vendor's portfolio of hardware and software switching platforms addresses most enterprise data center networking use cases as well as scale-out cloud solutions.

Based on client deals that Gartner observes, Dell EMC pricing is very aggressive.

Dell EMC has taken a very open approach to data center networking, including support for other vendors' NOSs to run on its hardware, in addition to submitting its own NOS (OS10) to open source.

Dell EMC also provides compute, storage and integrated system infrastructure, and we expect increased bundling with networking (including VMware's network software, NSX). This appeals to customers that prefer to purchase their infrastructure from a single vendor.

CAUTIONS

Despite being announced in January 2016, Dells flagship NOS OS10 was not commercially available until May 2017 and so has limited adoption in enterprise environments.

The number of available software options to run on Dell EMC switches can create confusion among customers regarding which option is ideal.

The vendor has a nontraditional strategy and is not a top five data center switching vendor, whether measured by 2016 port shipments or revenue.

Dell EMC has more limited brand awareness and visibility in networking when compared to leading vendors in this research, and its networking channel is less robust than those of some competitors.

Extreme Networks

Extreme Networks, headquartered in San Jose, California, is currently a smaller player in the data center networking market, but one that is making major bets to increase its relevance for future solutions. During 2016, Extreme's data center networking revenue dropped 16% year over year in a market that grew 13%. Chassis solutions from both legacy Extreme and Enterasys were showing their age, and Extreme made a conscious decision to refocus the portfolio more toward midmarket solutions. However, shifting strategies has left Extreme lagging in key technologies. To fill this gap, the vendor has made two major announcements during 1Q17, announcing the intention to acquire the data center networking assets of Brocade (expected to close in 2017), as well as

announcing that it has a stalking-horse bid to acquire the data networking portfolio from Avaya as part of Avaya's Chapter 11 restructuring activities. (This deal should also close by the end of 2017.) When both of these deals are completed, Extreme's presence in the data center networking market would nearly triple in size; at the same time, however, the vendor will need to deal with maintaining revenue streams and supporting all legacy portfolios.

Integration of these wide-ranging technologies will prove challenging, and existing and potential customers should demand a clearly articulated strategy on how existing platforms will be supported, as well as Extreme's future platform and software rationalization strategy. Until a new strategy has been articulated, existing Extreme customers, as well as those looking for an end-to-end pure-play network solution in North America, Latin America and Europe, should consider Extreme.

STRENGTHS

The vendor has an aggressive growth and investment strategy to strengthen the portfolio and acquire significant installed base.

Extreme offers aggressive pricing in competitive situations and has very strong customer support, which has ranked at or near the top of reference surveys and Gartner client inquiry discussions.

Extreme is a pure-play network alternative, with solutions in wired and wireless campus and data center, which can appeal to midmarket clients looking for one-stop LAN shopping.

Upon closing of the Avaya and Brocade acquisitions, Extreme will have competitive Layer 2 and Layer 3 fabrics and significantly improved software capabilities, and will be able to better serve the relevant installed base gained through the acquisitions.

CAUTIONS

Extreme has been slow to deliver newer technologies such as a 25G ToR and EVPN.

Extreme has suffered from shifting strategies and a midmarket focus on addressing next-generation data center network solutions, and this has caused it to lose market share and relevance within the data center market.

Integrating one or two new acquisitions will be extremely complicated and, while Extreme will be able to offer customers a much more complete offering, there is the risk that it will lose momentum with customers that are concerned about the future of current products or channel partners that might favor vendors with less internal challenges.

As Extreme combines the support and engineering resources from the acquired companies, it will be challenged to support all existing hardware and software platforms for years, so customers might be facing a platform refresh sooner than expected.

HPE

Hewlett Packard Enterprise (HPE), based in Palo Alto, California, has embarked on a significant shift in strategy over the past 12 months. On 1 May 2016, HPE completed the sale of 51% of its H3C subsidiary, responsible for the development of the FlexFabric portfolio, which represented its main data center switching offering. After the sale, HPE started pivoting its strategy toward becoming a reseller and system integrator, and now has a three-pronged offering: (1) In enterprise, HPE is now focused on integrating Arista Networks' data center switching products into the HPE portfolio for data center infrastructure; (2) Beyond Arista, HPE continues to expand its Altoline open networking brite-box portfolio with the addition of Big Switch software support (and also OEMs the Nokia [Nuage Networks] virtual network solution as HPE Distributed Cloud Networking, and resells VMware NSX overlay solutions); and (3) HPE retains a 49% ownership of the New H3C Group and will continue to sell H3C FlexFabric solutions to support existing networks for the foreseeable future.

The divestiture, market share distribution between HPE and H3C, and change in strategy have resulted in HPE dropping from the No. 2 vendor to the No. 5 vendor, as measured by Gartner's quarterly revenue market share reports. HPE can be considered for integration and deployment of Arista, H3C and other solutions on a global basis. Current FlexFabric customers can make tactical upgrades to their networks; however, we would not recommend any new build-outs of HPE-provided H3C FlexFabric solutions, as Arista would be an option that is better-aligned to the new strategy.

STRENGTHS

HPE has global reach (outside of China), with a strong presence in enterprise data centers.

The vendor has a depth of experience deploying data center networks.

HPE offers integrated data center solutions that combine best-of-breed technologies.

The vendor offers flexible business models such as Flexible Capacity (on-demand burst pricing for data center infrastructure) to address the changing needs of enterprise customers as workloads migrate to the cloud.

CAUTIONS

HPE is moving away from its internally developed data center network solutions and is becoming an integrator when it comes to data center networking.

With no direct control of the majority of its networking technology, HPE may lag in delivery of key technologies or form factors that are critical to its strategies within enterprise data centers.

With a declining focus on internally developed networking solutions, HPE may lose key resources required to integrate and support complex networking environments.

The vendor showed a noticeable drop in market share in data center networking during

2016, which may reduce the resources that are focused on this critical market.

Huawei

Huawei, headquartered in China, provides a broad range of telecommunications equipment and is the vendor with the highest growth in this Magic Quadrant, more than doubling its data center networking business in 2016 and now ranking among the top five players in this market. The vendor has its roots in China, which still accounts for more than 60% of its revenue, but it made strong investments in emerging markets and Europe, achieving fast growth abroad in 2016. Huawei's Cloud Fabric architecture is based on a controller and spine-and-leaf design. Huawei's strategy is to support multiple controller alternatives, leveraging open standards when possible and providing flexible design options to clients, through a broad portfolio of CloudEngine switches and software products. The vendor has a growing ecosystem of partners, including VMware for NSX, Red Hat for OpenStack, and Puppet and Ansible for DevOps. Huawei made substantial progress in marketing awareness, as well as the quality of its product literature and websites for global markets. Enterprises, especially those outside of North America, should consider Huawei for data center networking solutions.

STRENGTHS

Huawei has a broad data center switch portfolio (the CloudEngine line), from big chassis to fixed form factor, which can support the build-out of data center networks of any size.

Huawei offers flexible architectural options, mostly based on open standards. Clients can implement their solutions integrating Huawei products in different parts of the stack and combining them with open-source or third-party solutions.

Huawei can offer a complete converged infrastructure for the data center, including network, compute and storage, which can appeal to clients looking for one-stop shopping.

Huawei has massive financial resources and keeps investing in the development of regional markets, increasing its footprint outside of China and focusing on expansion in regions with a favorable geopolitical environment.

CAUTIONS

Despite global scale, Huawei has a developing enterprise channel outside of China and parts of Asia when compared to more established vendors.

Complex customer deployments that need deep expertise are sometimes supported by technical resources located in China, which can sometimes create challenges and delays due to the need for translation.

Huawei has a small presence in the U.S., and geopolitical concerns might be a factor in this and other markets.

Compared to other vendors, although it has made substantial progress, Huawei still

needs to increase market awareness and sales coverage with enterprise clients outside of China.

Juniper Networks

Juniper Networks, based in Sunnyvale, California, has an extensive data center networking portfolio under its Unite Cloud framework. It offers Virtual Chassis Fabric (VCF) for smaller networks (up to 800 servers) and Junos Fusion for larger networks (up to 6,000 servers), both leveraging the same QFX5K and QFX10K switch families. Contrail is its SDN solution, consisting of a virtualized overlay and a controller that can also control physical switches. Contrail is also available in an open-source version (OpenContrail). In VMware environments, Juniper switches can be controlled by NSX, enabling physical and virtual integration. Juniper ranks as the No. 3 vendor, based on 2016 revenue market share, and it increased its share in enterprise data centers by introducing new products in the QFX family, DCI and analytics, and by streamlining its marketing messaging around Juniper Unite Cloud. As a result, the vendor had solid growth in 2016, at above market rates.

All large organizations should consider Juniper on their shortlists for data center networking, in particular those environments that want to have multiple suppliers and solutions that can interoperate in multivendor environments.

STRENGTHS

Juniper has a portfolio of data center solutions based on common building blocks belonging to two product families (QFX5K and QFX10K), and experience in supporting mission-critical infrastructures.

The vendor favors open solutions that leverage standards (like EVPN) and enable multivendor interoperability.

Juniper's Contrail is a popular commercial SDN controller for OpenStack, with increasing deployments in the enterprise.

The vendor provides cost-competitive solutions and is an effective option for clients that want to have at least two network suppliers for their data center.

CAUTIONS

In enterprise, Juniper still lacks some focus and market presence, although it made significant progress in 2016.

Juniper has a partnership with VMware for integration with NSX, but is also competing with Contrail. The two companies pursue their sales strategies (partnering versus competing) on an account-by-account basis and that might confuse clients.

The vendor makes most of its overall revenue with service providers and large enterprise clients. Midsize clients should assess its market coverage level and the capabilities of its local channels.

Juniper is a networking and security company, and lacks the full data center portfolio of

some larger players. Juniper does partner with channel and industry partners that can provide compute and storage components (for example, for hyperconverged systems).

Lenovo

Lenovo, based in Morrisville, North Carolina, and Beijing, China, focuses on the server access and aggregation portion of the data center network. The vendor provides ToR switches and embedded switches for data center server systems, and their switches can also be integrated in multivendor server/networking environments. Lenovo partners with several other vendors, including Brocade and Juniper Networks, which increases customer choice and/or rounds out its networking portfolio to allow Lenovo to sell a complete data center networking solution. Over the past year, Lenovo launched its new NOS, called Lenovo Cloud Network Operating System. Lenovo can be considered for networking by organizations deploying Lenovo servers.

STRENGTHS

The vendor provides integrated blade switches for Lenovo's server platforms, including BladeSystem and Flex System with equivalent ToR switches to deliver a consistent networking experience for customers deploying both blade and rack services.

The vendor now supports ONIE on some of its switches, which we believe is an indication of future support for disaggregation and open networking.

Lenovo provides access switches that support Fibre Channel and Ethernet in the same physical form factor.

End users rated Lenovo solutions above average for ease of use.

CAUTIONS

Lenovo has been late to market with several physical interface capabilities, including 10GBASE-T and 25/100 Gbps, although we anticipate these capabilities will be added during 2017.

The vendor's portfolio of switches lacks the breadth of most vendors in this Magic Quadrant, although it partners with Juniper Networks to fill gaps and has plans to add further portfolio options to expand its use-case coverage.

Lenovo lacks several features that are increasingly important in the data center networking market, including VXLAN, VTEP, NSX certification and native support for Puppet/Chef.

Lenovo has limited brand visibility and awareness as a network vendor. We do not see Lenovo in opportunities where it is not the server vendor.

NEC

NEC, based in Tokyo, has been one of the leaders driving SDN solutions into the data center. We estimate that NEC has deployed over 400 enterprise SDN networks — mostly in Japan, although it does have reference customers across the Asia/Pacific region and EMEA. The number of SDN customers more than doubled during 2016 as NEC enhanced

its controller software to support large-scale environments and increased software functionality, including support of non-OpenFlow switches. NEC expanded the number of supported third-party switches and has also focused on ensuring support for OCP-based original design manufacturer (ODM) switch hardware. While NEC's strategy is to focus on its software solutions, it also added to its hardware portfolio during 2016. However, those that need support for newer 25/100G interfaces and more flexible form factors will have to look to third-party hardware.

NEC should be considered when a standards-based, scalable fabric environment is required, especially for organizations with a large presence in Japan. Those outside of Japan should verify local resources and references.

STRENGTHS

NEC is one of the leaders in standards-based SDN deployments, with significant experience to apply across a wide number of use cases.

The vendor has demonstrated capabilities to support large-scale networks with many thousands of network nodes.

NEC has strong service capabilities to assist enterprises in deploying SDN technologies to meet a variety of business needs.

NEC promotes open networking, is contributing to SDN standardization efforts and has a broad ecosystem of partners, which make its solutions applicable to multivendor environments.

CAUTIONS

NEC's hardware portfolio lags the requirements for early adopters, with a limited portfolio of older switch platforms and no support for 25/100G interfaces.

NEC's sales are largely concentrated in Japan, with limited deployment expertise in other markets.

NEC has a limited marketing budget and lacks coordination among its regional business units, which results in it having limited awareness outside of Japan.

Deployment and initial configuration of NEC SDN solutions is complex, although the vendor plans to support zero-touch automatic configuration and software updates in the future.

New H3C Group

New H3C Group is based in China and offers customers a complete portfolio of enterprise IT solutions, including networking, firewalls, servers, storage, hyperconverged systems and IT management products. New H3C also provides a full range of HPE-branded servers, storage and technology services as a provider focused on the Chinese market.

New H3C jumped to being the No. 3 overall data center networking vendor in 2016, when

measured by port shipments. Over the past year, the vendor released its VCF Controller product, which provides automated switching fabric management software. The vendor competes directly in China, while leveraging HPE to sell and support customers outside the Asia/Pacific region. Organizations in China should consider this vendor for data center networking.

STRENGTHS

New H3C has a solid portfolio of data center networking switches, with different form factors and interface speeds, and can also provide x86 compute, storage and firewall capabilities, which is appealing for organizations looking for a full-stack single-vendor solution.

The vendor was the No. 3 vendor in 2016 when measured by total data center networking port shipments, with approximately a 7% share.

New H3C has proven experience in large-scale network environments, including hyperscale cloud providers, and end users expressed above-average overall vendor satisfaction.

New H3C was early to market in delivering EVPN functionality and now has more than 30 customers running it in production environments.

CAUTIONS

At this time, New H3C is focused on selling data center networking solutions in China.

New H3C is reliant on HPE as its primary route to market outside of China to sell and support customers. However, HPE is pivoting toward Arista Networks as its lead offering instead of New H3C in certain geographies, and we believe this will reduce New H3C's ability to sell and support customers outside of China.

The vendor has not achieved certification for VMware vRealize integration, which other competitors have.

Customers have experienced challenges due to product updates, including upgrades to its fabric software, IRF.

VMware

Based in Palo Alto, California, VMware provides software solutions for cloud infrastructure and digital workspaces. NSX is its network virtualization platform, consisting of a controller and virtual switches running in each hypervisor. NSX creates an SDN overlay that enables communication across virtualized workloads. The NSX overlay can run on top of any physical network underlay. Connectivity to nonvirtualized resources, like bare-metal servers or physical appliances, is achieved through servers acting as gateways or through physical switches from certified technology partners, which can be controlled by NSX and act as VxLAN Tunnel Endpoints (VTEPs). In 2016, VMware focused on improving NSX manageability and operations through better correlation between the overlay and the underlay, and also through the acquisition of Arkin Net. VMware is

leveraging its strength in the virtualization market to promote NSX, especially when clients are renewing their vSphere licenses, which resulted in a total installed base of more than 2,400 customers and 850 production deployments. In 2016, VMware extended its virtual networking and security to the cloud and announced a partnership with Amazon Web Services (AWS) where NSX will be a key component of its cloud stack, enabling enterprises to move workloads from the on-premises VMware private cloud to the VMware public cloud environment hosted by AWS.

NSX should be considered by all organizations evaluating network overlay solutions, especially existing VMware virtualization customers that are looking to build a software-defined data center (SDDC) or a private/hybrid cloud.

STRENGTHS

VMware is a leader in server virtualization, and its virtual switches are widely deployed, reliable and well-known by customers.

NSX is a software solution that can be easily piloted and deployed gradually, with no hardware dependencies, although it provides integration capabilities with switches from certified NSX technology partners.

NSX microsegmentation leverages each vSwitch as a stateful Layer 3/Layer 4 distributed virtual firewall to increase intra-data-center security, providing centralized control and policies.

VMware is a software company with solutions for infrastructure virtualization that go beyond networking. Its ability to integrate NSX with other software platforms provides it with strong differentiation from vendors focused solely on networking.

CAUTIONS

Gartner has observed that many clients find NSX expensive at scale, although in 2016, VMware introduced three feature sets (Standard, Advanced and Enterprise) with increasing capabilities and cost to enable a more granular selection.

VMware cannot provide a complete solution that includes the physical network; customers must deal with other networking vendors to purchase hardware.

There are two different NSX codebases: NSX for vSphere and NSX-T for other hypervisors that customers receive with their NSX license. Customers must choose the best fit while recognizing that NSX-T will constitute the basis for a future unified codebase, necessitating some future software and feature changes.

When NSX controls physical switches through VTEP integration, there are limitations in the microsegmentation that can be achieved with the attached physical resources.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over

time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

Big Switch Networks was added, as it now meets our inclusion criteria for revenue growth and enterprise customers.

Cumulus Networks was added, as it now meets our inclusion criteria for revenue and enterprise customers.

Dropped

Avaya was dropped because we cannot fairly evaluate its future solution strategy due to its publicly stated intention to divest its data networking asset as part of its current Chapter 11 proceeding. Extreme entered a stalking-horse bid to acquire Avaya's data networking assets on 7 March, which was approved in U.S. Bankruptcy court on 25 May (see "Avaya Inc. Files for Chapter 11 Protection," (https://www.google.it/url?sa=t&rct=j&q=& esrc=s&source=web&cd=1&ved=0ahUKEwievNqD5eTTAhXBZCYKHX68DcUQFggqMAA& url=http%3A%2F%2Fwww.avaya.com%2Fen%2Fabout-avaya%2Fnewsroom%2Fnews-releases%2F2017%2Fpr-us-170119a%2F&usg=AFQjCNHndJJKHO-e9WgcxmKEGphGxJcC0A&sig2=pvQyxTNabP7BTAU2gg2SpA&cad=rjt) "Avaya Enters Into Asset Purchase Agreement With Extreme Networks," (https://www.google.it/url?sa=t&rct=j& q=&esrc=s&source=web&cd=1&cad=rja&uact=8& ved=0ahUKEwjn6arT5eTTAhXC8CYKHfn3CXIQFggjMAA&url=http%3A%2F %2Fwww.avaya.com%2Fen%2Fabout-avaya%2Fnewsroom%2Fnews-releases%2F2017%2Fpr-us-170307%2F&usg=AFQjCNHYXlQAEdLDwLA2eDqw7SJyPPKFxA&sig2=wBFbfLw-gBXEWR9ecHe3-g) "Extreme Networks Jumps After Bidding for Avaya Networking Business" (http://www.marketwatch.com/story/extreme-networks-jumps-after-bidding-for-avaya-networking-business-2017-03-07) and "Bankruptcy Court Clears Avaya's Sale of Networking Business" (https://www.reuters.com/article/bankruptcy-avaya-idUSL1N1IR1XK)).

Brocade was dropped because we cannot fairly evaluate its vision, per its future strategy. Brocade is expected to be acquired by Broadcom, which has publicly stated its intention to divest the Brocade data center networking business (see "Broadcom Limited to Acquire Brocade Communications Systems Inc. for $5.9 Billion" (http://investors.broadcom.com/phoenix.zhtml?c=203541&p=irol-newsArticle&ID=2218429)). Further, on 29 March, Extreme Networks announced its intent to acquire Brocade's data center networking business after Broadcom closes its acquisition of Brocade (see "Extreme Networks to Acquire Brocade's Data Center Networking Business" (https://urldefense.proofpoint.com/v2/url?u=http-3A__investors.broadcom.com_phoenix.zhtml-3Fc-3D203541-26p-3Dirol-2DnewsArticle-26ID-3D2257461&d=DwMFAg&c=IL_XqQWOjubgfqlNi2jTzg& r=QsKxaO6RIBZEFpHLNwv06m48X1HyJNit2Fxa10zH1mc& m=T9pQMNx2-3zgTRnKAVrA1SxlUN5P6cAYI4xRZ1Cy1ek&

s=WX_ynoduhoiL_M1JMTUDAAEULRVf6__thA3NViQomPw&e=)). Extreme has publicly stated that it will retain the Brocade portfolio and honor current support contracts (see "An Open Letter to Brocade Data Center Networking Customers and Partners" (https://content.extremenetworks.com/extreme-networks-blog/an-open-letter-to-brocade-data-center-networking-customers-and-partners) and "Update on Avaya Networking and Brocade Data Center Networking Acquisitions" (https://content.extremenetworks.com/extreme-networks-blog/an-open-letter-to-brocade-data-center-networking-customers-and-partners)).

Inclusion and Exclusion Criteria

To qualify for inclusion, vendors need to:

Provide hardware and/or software addressing the emerging enterprise data center networking requirements outlined in the Market Definition/Description and Extended Market Definition sections.

Produce and release enterprise data center networking products for general availability as of 10 February 2017. All components must be publicly available, shipping and included on the vendors' published price list. Products shipping after this date will only have an influence on the Completeness of Vision axis.

Demonstrate at least 100 production enterprise data center customers.

Show relevance to Gartner clients by meeting at least one of the following:

More than $50 million of product revenue in the enterprise data center networking market over the last four quarters

More than $25 million of product revenue in the enterprise data center networking market over the last four quarters *and* growth at more than five times the market rates from the prior four quarters

Honorable Mentions

The data center networking market is extremely dynamic and innovative, as vendors attempt to bring new ideas and solutions to the enterprise market. We track a number of vendors that do not yet meet our inclusion criteria, because we believe they have the potential to impact this marketplace over time, and to provide advice to our clients that ask about smaller, innovative vendors. Vendors being actively tracked in this market include ALE (formerly Alcatel-Lucent Enterprise), Allied Telesis, D-Link, Mellanox Technologies, Edgecore Networks, Microsoft, Midokura, Netgear, Nokia (Nuage Networks), Oracle, Pica8, Pluribus Networks, Plexxi, Quanta Cloud Technology-PLUMgrid and SnapRoute.

Evaluation Criteria

Ability to Execute

The following provides some insight into the criteria Gartner uses when evaluating a vendor's Ability to Execute. At a high level, our analysis of Ability to Execute attempts to capture how well a vendor is performing across the primary functional units of the business — product, sales/channels, marketing, service/support and financial:

Product or Service: Evaluates vendors by looking at their overall portfolios, including the ability to deliver and manage all hardware and software aspects of data center networking. This includes Ethernet fabric architectures, core/spine switches, ToR/leaf switches, virtual switches, blade switches, fabric controllers and applications (SDN-based and conventional), and the relevant management, orchestration and control of the architecture. We consider product and architectural migration strategies, and the ability to address virtualization, latency and scalability issues for both north-south and east-west traffic. More emphasis is placed on capabilities that would apply in open environments, including disaggregation and SDN, because many of those areas cross the boundaries of the IT architecture, making proprietary protocols a challenge.

Overall Viability: Viability includes an assessment of the overall organization's financial health; the financial and practical success of the business unit; and the likelihood that the individual business unit will continue to invest in and offer the product, and advance the state of the art within the organization's portfolio of data center switching products. Geopolitical issues will also impact overall viability for some vendors in this market.

Sales Execution/Pricing: Evaluates presales and go-to-market activities of both the vendor and its channels, and includes an analysis of how the vendor interacts with its potential customers. The second aspect of this criterion includes our evaluation of the cost-effectiveness of the solutions for capital purchase and long-term maintenance, and the ability to recognize and position the most appropriate solution in specific sales situations.

Market Responsiveness/Record: Assesses the ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the provider's history of responsiveness.

Market Execution: Focuses on how the vendor is perceived in the market, and how well its marketing programs are recognized. For data center network infrastructure, the evaluation focuses on how well the vendor is able to influence the market around key messages and attributes related to operational agility, changing size and density requirements, and new application architectures. An additional indicator for this criterion is how often Gartner clients consider a vendor as a possible supplier in a shortlist evaluation. The change in momentum in this indicator is particularly important.

Customer Experience: Looks at all aspects of the customer interaction, with a heavier weighting on postsales service and support activities.

Table 1. Ability to Execute Evaluation Criteria

Evaluation Criteria	Weighting
Product or Service	High
Overall Viability	Medium
Sales Execution/Pricing	High
Market Responsiveness/Record	Medium
Marketing Execution	Medium
Customer Experience	High
Operations	No Rating

Source: Gartner (July 2017)

Completeness of Vision

Evaluations for Completeness of Vision attempt to determine how well the vendor understands and is preparing for future market conditions, as well as how it is shaping the future market:

Market Understanding: Assesses the vendor's ability to look into the future and drive new ideas into product roadmaps and offerings. In this market, leadership in driving the data center network to address increased network agility, size/density, changing application architectures, openness, choice and investment protection are good examples of what we are looking for. This includes the vendor's strategies around open networking, automation and programmability, disaggregation, SDN, and other emerging architectural approaches.

Marketing Strategy: Evaluates the ability of the vendor to influence the market through its messaging and marketing campaigns. Vendors that incorporate and drive the three key data center network market transitions demonstrate an ability to use their marketing strategies to their advantage.

Sales Strategy: Evaluates how the vendor exploits new business models that are emerging due to market and technology transitions.

Offering (Product) Strategy: Evaluates how the vendor invests in R&D to continue to innovate in the key market transitions identified in the Market Definition/Description and Extended Market Definition sections. This includes roadmaps around open

networking, disaggregation, SDN and other emerging architectural approaches.

Business Model: Assesses the soundness and logic of a technology provider's underlying business proposition.

Innovation: Measures the vendor's ability to drive innovation to satisfy emerging data center networking requirements, and how the vendor invests in new transformational technologies to move its business and the market forward. A key attribute in the data center market is for the vendor to innovate in technology areas that best meet emerging market requirements.

Table 2.   Completeness of Vision Evaluation Criteria

Evaluation Criteria	Weighting
Market Understanding	High
Marketing Strategy	Medium
Sales Strategy	Low
Offering (Product) Strategy	Medium
Business Model	Medium
Vertical/Industry Strategy	No Rating
Innovation	High
Geographic Strategy	No Rating

Source: Gartner (July 2017)

Quadrant Descriptions

Leaders

A Leader has demonstrated a sustained ability to meet the changing needs for mainstream data center architectures. A Leader also has the ability to shape the market and maintain strong relationships with its channels and customers, while offering solutions for the data center infrastructure market.

Challengers

A Challenger has demonstrated sustained execution in the marketplace, and has clear, long-term viability in the market, but has not shown the ability to shape and transform the

market.

Visionaries

Visionaries have demonstrated an ability to increase the features in their offerings to provide a unique and differentiated approach to the market. A Visionary has innovated in one or more of the key areas of data center infrastructure, such as management (including virtualization), security (including policy enforcement), SDN and operational efficiency, and cost reductions.

Niche Players

A Niche Player has a complete or near-complete product offering, but does not have strong go-to-market capabilities (such as for channels) or has geographical limitations. A Niche Player has a viable product offering and, in some cases, will be an appropriate choice, depending on the usage scenario.

Context

This Magic Quadrant focuses on data center networking solutions to solve the emerging requirements for a scalable, high-performance and simply managed network that better integrates into a more cohesive data center architecture. The data center networking market, as described in this research, is still evolving as architectures and vendor differentiation continue to be developed.

Because the market is rapidly changing and requirements are evolving, organizations should ensure that they understand the shifts in application architectures and how they impact the network. Data center organizations should carefully evaluate alternate approaches and vendor solutions to arrive at the most appropriate future architecture.

Market Overview

The data center networking solutions covered in this research are hardware and/or software solutions to deliver connectivity within enterprise data centers, in support of an organization's applications. Network technology solutions include data center core/spine switches, server access switches (ToR, leaf), virtual switching, SDN solutions, SDN overlays, emerging designs that leverage disaggregation of hardware from software and open-source components.

This research covers the data center switching market, and it is aimed at enterprises that procure and manage their own data center infrastructure, for installation within their premises or in colocation facilities.

Public cloud providers and hyperscale data centers are also large consumers of data center switching solutions, but their buying criteria and requirements are significantly different and not considered in this research. We envision, however, that functionalities for building a hybrid cloud, through seamless integration of enterprise-owned network solutions with public cloud services, will play an increasing role in vendor selection in the

near future.

Extended Market Definition

Typical Business Outcomes — The fundamental business outcome is local connectivity within enterprise data centers, between servers, data center appliances (like firewalls, application delivery controllers), IP storage and those network edge platforms that provide connectivity to the rest of the enterprise network or other data centers. This local connectivity is needed to support applications and services running in the data center.

Market — Data center networking provides network functions that support connectivity within enterprise data centers. Connectivity can be provided by physical switches, which comprise hardware and software, but with the emergence of network virtualization and new architectural models like SDN, software overlays became an additional option in the market and are considered in this Magic Quadrant. Further information on the data center switching market can be found in "Market Share: Enterprise Network Equipment by Market Segment, Worldwide, 3Q16."

Typical Buyers — Within the enterprise, CIOs, CTOs, VPs of I&O, directors of networking and network managers are typically the buyers of data center networking Infrastructure.

How Do Buyers Shape Their Buying Decision — Data center networking equipment is business-critical and has a long life cycle, so buyers are strongly influenced by historical vendor relationships, experiences with the quality of their support and technical familiarity with previously installed products. In terms of feature/functionality, buyers typically focus on several factors, including performance, form-factor, deployment options, supplier availability and ease of management, as well as integration with higher-level infrastructure orchestration platforms, automation tools, programmability through an API, visibility/analytics, customer experience, brand visibility and overall solution architecture. Price, for both equipment and support, is also a factor, although not the main driver for most enterprise buyers.

Deliverables — The most common deliverable is in the form of a switch (physical or virtual) or switching fabric, and the requisite management and control affiliated with the switches. The switches provide physical and logical data network connectivity for IT infrastructure residing in the data center (like servers, IP storage systems, security platforms and other network appliances). The most common network technology deployed in data centers is Ethernet, in all speed variants from 1 to 100 gigabits, with copper or fiber cables. Virtual overlays are a more recent addition and provide logical connectivity over the physical network, leveraging virtual switches and creating virtual tunnels with protocols like VXLAN. Typical network functions include the ability to create virtual network segments and manage logical connectivity at Layer 2 (VLANs and VXLANs) and Layer 3 (IP routing). Some solutions are referred to as Ethernet fabrics and can be managed as a single logical entity through a GUI or API, rather than at the individual switch level, providing zero-/low-touch provisioning on its devices. This

concept is common also with solutions that are marketed as SDN, although each vendor has a different architecture underneath (for Gartner's definition of SDN, see "Software-Defined Networking: A Taxonomy").

How Do Providers Package, Market and Deliver — Buyers typically source their data center network: (a) directly from network equipment suppliers, or (b) via a reseller or system integrator. The data center network is normally purchased (capex) and maintained for a number of years under a support contract. In the last two years, we have seen a trend toward disaggregation of hardware and software in pricing, even for proprietary solutions that do not provide third-party options. Alternative software options can often be selected for the same hardware platform, and some vendors propose perpetual software licenses and price software support separately from hardware support. These changes in pricing scheme show that value is shifting from hardware to software/services and impacting vendor's revenue composition. Data center networking solutions can also be procured from some vendors via leasing, pay-as-you-grow or other consumption-based pricing models.

Data center networking solutions are characterized by the following elements:

Physical Interfaces — Physical interfaces to plug-in devices is a very common component of products in this market. 10G is now the most common interface speed we see in the data center proposals (pull-in stats). However, we are now seeing the introduction of new Ethernet connectivity options at higher speeds (25GbE, 50GbE and 100GbE) and a new generation of data center network switches, which can handle cloud-scale routing and MAC tables, to deliver new levels of performance and scalability. These technologies have been initially introduced to fulfill the needs of hyperscale data centers, but vendors are also making them affordable for enterprises. Hence, performance is rarely an issue for new implementations, and speeds and feeds are less relevant as a buying criterion for the majority of enterprise clients, when compared to automation and ease of operations.

Physical Topology — The spine-and-leaf (Clos) topology is the most common physical network design, proposed by nearly all vendors with their switches. It has replaced the historical three-tier design (access, aggregation, core) in every new project. This design is better-suited to support the massive east-west traffic flows created by new application architectures (see "Simplify Your Data Center Network to Improve Performance and Decrease Costs").

Switching/Infrastructure Management — Programmable Ethernet fabric provides management for a collection of switching as a single construct, and provides an API. Fabrics are commonly adopted as logical control planes for these spine-and-leaf designs, replacing legacy protocols like Spanning Tree Protocol (STP) and enabling full concurrent utilization of all the available paths.

Overlays and Broader MANO — In addition to the physical architecture and management of physical switches, extension of MANO of data center networking into

the broader data center infrastructure is increasingly important. To this end, we see overlay tunneling protocols like VXLAN used with virtual switches to provide L2 connectivity on top of scalable L3 spine-and-leaf designs, enabling support of multiple tenants and a more granular network partitioning (microsegmentation), to increase security within the data center. Controllers that provide a GUI are commonly used to manage these VXLAN overlay fabrics, as well as autodiscovery of new switches, to simplify network operations and reduce reliance on CLI device-level management. Most network solutions now also provide an API, to enable programmability and integration with orchestration platforms.

Note 1
Cisco Arista Litigation

On 5 December 2014, Cisco filed a complaint against Arista Networks in the California Northern District Court. Details of the filing can be found at "Cisco Systems, Inc. v. Arista Networks, Inc." (http://dockets.justia.com/docket/california/candce/5:2014cv05343/282779) During 2015, the case was also filed with the United States International Trade Commission. The legal dispute is ongoing, with some rounds won by Cisco and others by Arista.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and

business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.

About (http://www.gartner.com/technology/about.jsp) |
Careers (http://www.gartner.com/technology/careers/) |
Newsroom (http://www.gartner.com/newsroom/) |
Policies (http://www.gartner.com/technology/about/policies/guidelines_ov.jsp) |
Privacy (https://www.gartner.com/privacy) |
Site Index (http://www.gartner.com/technology/site-index.jsp) |
IT Glossary (http://www.gartner.com/it-glossary/) |
Contact Gartner (http://www.gartner.com/technology/contact/contact_gartner.jsp)