

Manufacturer Virtualizes Data Center Apps

NetApp used Nexus Switch platform to build cloud-computing environment with low-cost 10 Gigabit Ethernet connectivity.

EXECUTIVE SUMMARY	
NetApp	
<ul style="list-style-type: none"> • Manufacturer • Sunnyvale, California • 8000 employees 	
Business Impact	
<ul style="list-style-type: none"> • Reduced cabling costs by 79 percent • Reduced network equipment costs by 40 percent • Saved US\$150,000 on DMZ by using Virtual Device Context • Enabled cost-effective scalability 	



Business Challenge

A global company headquartered in Sunnyvale, California, NetApp creates innovative storage and data management solutions and is an industry leader in 10 Gb storage. When NetApp's two California data centers outgrew available space and power capacity, the company decided to consolidate them and build two new data centers. A new facility in Raleigh, North Carolina would be used for development, quality assurance, and disaster recovery. Another facility in Sacramento, California would house production applications.

The IT team wanted to virtualize applications in the new data centers to minimize equipment costs, management overhead, and energy consumption. Virtualization would require:

- Providing 10 Gigabit Ethernet connectivity for a new generation of servers
- Enabling virtualization features such as VMware VMotion and Data Distribution Services (DDS)
- Preparing for future adoption of Fibre Channel over Ethernet (FCoE) and IEEE 802.1 Data Center Bridging (DCB)
- Creating a highly available, scalable, and repeatable design with no single point of failure

Solution and Results

NetApp and Cisco share a vision of dynamic, fully virtualized server, network, and storage environments built on high-performance Ethernet frameworks. The two industry leaders have worked together since 2003 to deliver unified, fully integrated architectures. Therefore, it was a natural fit for NetApp to use the Cisco® Nexus platform to build a cloud-computing environment in Raleigh. Then, one year later, the IT team used the same design in a new production data center in Sacramento. "Of all the data center switches we evaluated, the Cisco Nexus 5000 Switch best matched the 300 requirements we identified for application virtualization, including Layer 2 access support, an enhanced 10 Gigabit Ethernet backbone, 10 Gigabit Ethernet server connectivity, and FCoE support," says Kamal Vyas, lead network design engineer, NetApp.

The design in both data centers is based on microzones, groups of eight racks containing similar devices, such as blade servers, rack-optimized servers, or storage. A virtualized application can operate on any available server in a compute microzone, increasing server utilization.

All devices in a microzone eventually connect to one or two Cisco Nexus[®] 5020 Switches in a center rack. Larger database servers connect directly, over 10 Gigabit Ethernet. Servers with Gigabit Ethernet adapters connect by way of Cisco Nexus 2148T Fabric Extenders. In the Sacramento data center, rack-optimized servers that need 10-Gbps bandwidth connect by way of Cisco Nexus 2232PP Fabric Extenders, which contain 32 1/10-Gbps server ports and eight 10-Gbps uplinks. Older servers with 100 Mbps interface cards connect by way of Cisco Nexus 2248TP Fabric Extenders. Each microzone's Cisco Nexus 5020 Switches connect over 10 Gigabit Ethernet to a Cisco Nexus 7000 Series Switch at the aggregation layer. Microzones connect to the SAN through a Cisco Multilayer Director Switch (MDS).

All network services in the new data center are consolidated at the services layer, which comprises a pair of Cisco Catalyst[®] 6509 Switches with Cisco ACE Application Control Engine modules. Later, NetApp will add new services modules, possibly including Cisco Proactive Automation of Change Execution, Cisco Firewall Services Module, and Cisco Network Analysis Module.

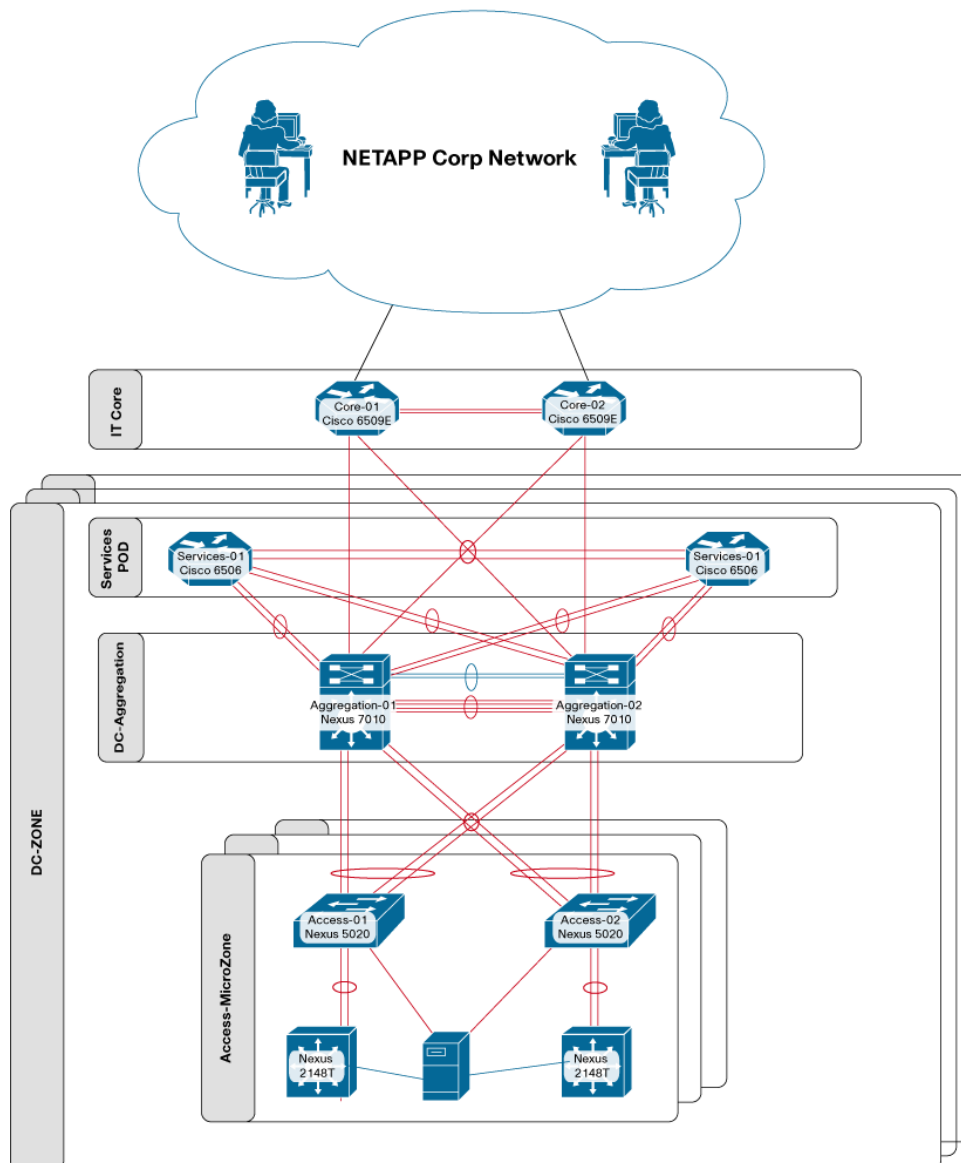
Using the Cisco Nexus platform in the data center provides the following benefits for NetApp:

- **Cost-effective connectivity for 10-Gbps servers:** In the Sacramento data center, approximately 70 percent of servers have 10 Gigabit Ethernet cards to support virtualization. "The cost of 10 Gigabit Ethernet servers has come down, and now Cisco Nexus 2248TP Fabric Extenders provide inexpensive 10-Gbps switch ports, as well," says Vyas. In most data centers, devices that need even a little more than 1-Gbps bandwidth require a 10-Gbps switch port. "With the virtual PortChannel support in Cisco Nexus 2248TP Fabric Extenders, we can provision a server with dual 1-Gbps connections if that's all it needs," says Vyas.
- **Lower costs:**
 - *Cabling:* Deploying the Cisco Nexus gear in the middle of each microzone reduced cabling costs by 80 percent.
 - *Elimination of switches for 100-Mbps servers:* Now that NetApp's 100-Mbps servers can connect to the network through Cisco Nexus 2248TP Fabric Extenders, the company no longer needs to provision switches for each microzone containing these servers. "We have the option to completely eliminate our out-of-band network," Vyas says.
 - *Virtualization support:* "Application virtualization reduced our infrastructure costs by 40 percent, and the Cisco Nexus 2000 and 5000 access switches are an important enabler for virtualization because they provide 10-Gbps bandwidth," says Mike Morris, Manager - IT Communications Engineering.
 - *Core switch for DMZ:* Rather than deploying two physical switches to separate internal and external traffic, NetApp separated a single physical Cisco Nexus 7000 Switch into two virtual device containers (VDC), each connecting to a separate Cisco Nexus 5000 Switch. "The VDC support on the Cisco Nexus 7000 saved US\$150,000 on our DMZ, or 43 percent of the total budgeted costs," says Morris.
- **Increased resilience:** NetApp uses the virtual PortChannel (vPC) feature in Cisco Nexus Switches to provide redundant connectivity. In addition, the IT team uses the in-service software upgrade (ISSU) feature to upgrade Cisco Nexus 7000 Series Switches while they continue to forward traffic.
- **Cost-effective scalability:** NetApp built the networks for its new data centers at the right size to meet current needs and can scale easily as needed to meet fast-paced growth. The modular design of Cisco Nexus switches makes it simple to add network capacity scalability. When a microzone needs more ports, NetApp can purchase expansion modules for the Cisco Nexus 5020 Switch or add Nexus 2000 Fabric Extenders instead of purchasing a new switch.

- Reduced management overhead:** The IT department can configure and manage all Cisco Nexus 2000 Fabric Extenders through the Cisco Nexus 5020 Switch, as if they were one device. “We found a lot of similarity between the Cisco IOS Software and the NX-OS, so it was a smooth transition to Nexus switches,” says Vyas.
- Energy efficiency:** NetApp’s data center has a hot-aisle/cold-aisle layout. The front-to-back airflow and rear-facing ports on Cisco Nexus switches enabled NetApp to install the pressurized cooling system directly above the cold aisles, significantly reducing cooling costs. The Raleigh data center has achieved a Power Usage Effectiveness (PUE) rating of 1.2, far exceeding the U.S. Environmental Protection Agency (EPA) recommendation of 2.0.
- Support for a unified fabric:** NetApp purchased FCoE licenses for the Nexus 5000 Switches to consolidate the separate data network and storage area network into a single fabric.

Vyas received the Network Professional Association Award for Excellence for the Cisco Nexus-based data center design.

Technical Implementation



“The cost of 10 Gigabit Ethernet servers has come down, and now Cisco Nexus 2232 Fabric Extenders provide inexpensive 10 Gbps switch ports, as well.”

— Kamal Vyas, Team Lead - Data Center Services, NetApp

For More Information

For more information on the Cisco Nexus family of data center switches, visit <http://www.cisco.com/go/nexus>.



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