Unlocking cloud computing potential with open networking

By Jeffrey Baher

Data center operators deploying cloud computing and large-scale applications thrive on open architectures, open automation, and open ecosystems. Dell™ Force10 provides high-performance, standardized networking that raises the bar for business agility.

Organizations taking a practical path to cloud computing typically blend leading-edge technologies with existing hardware and applications to manage IT workloads efficiently and enhance business outcomes. In the cloud computing model, data center managers can mix and match computing, storage, and networking resources to provide an agile and highly flexible architecture for applications.

Realizing the full potential of cloud computing architectures requires open, standardized interfaces between data center layers of compute resources, storage units, and network infrastructure. But while many organizations are moving toward open computing and storage layers, networking resources have remained largely proprietary in comparison to server and storage platforms.

That paradigm is changing. The Dell Force10 Open Cloud Networking framework is designed to offer advanced networking in an open, standardized manner. Combined with standards-based Dell servers and storage, Dell Force10 Open Cloud Networking enables administrators to optimize their data centers with open architectures that are not constrained by proprietary networking resources. (For more information on this framework, see the sidebar, “Open Cloud Networking: High-performance, agile data center architectures.”)

Moving beyond the limitations of closed networking

Over time, computing has moved from proprietary to open standards, as IT has evolved from mainframe environments to client/server systems to Web 2.0 and on to cloud computing (see Figure 1). Open standards have helped simplify the building of virtualized data centers for IT organizations. In these dynamic data centers, compute resources can be created or decommissioned in real time as the need arises, which defines the essence of cloud computing.

Maximizing flexibility allows cloud computing environments to work as expected, and helping to ensure that all layers of the data center stack are open—including computing, storage, networking, and automation—enables this flexibility. Together, open architectures, automation, and ecosystems support the widely varied needs of data center operators.

However, the network layer has not kept pace with servers and storage in the move toward open architectures. Many networking vendors have developed proprietary software, control plane, or interconnect technology. Limited, closed network layers force IT organizations to build data centers with specific servers and storage units in a way that may not meet their needs.

To boost IT agility and business response, the Dell Force10 Open Cloud Networking framework offers enhanced network flexibility, performance, and...
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manageability for data centers operating cloud computing platforms as well as conventional IT environments. This open framework is well suited for data center architectures driven by systems or business process requirements tailored to specific organizational requirements. The Dell Force10 Open Cloud Networking framework is designed to offer high-performance, energy-efficient, and scalable networking for the most demanding cloud, Web 2.0, and conventional enterprise data centers. Dell servers and storage can be interconnected with these open, standardized networking resources to provide highly customized architectures.

Building an open networking framework

The Dell Force10 Open Cloud Networking framework is based on open architectures, open automation, and open ecosystems. These architectures comprise core, end-of-row, and top-of-rack switching nodes that enable organizations to mix and match resources at each layer of the data center stack. The Dell Force10 Open Automation (OA) framework provides standards-based automation for data center operations including bare-metal provisioning, Perl and Python scripting, and a suite of capabilities for virtual machine networking.

Data center infrastructure comprises open, standards-based interfaces and interconnect and control plane technologies. Dell Force10 multi-terabit, chassis-based E-Series and fixed-configuration, distributed Z-Series systems offer high-performance data center core networking. Dell Force10 S-Series top-of-rack access systems, including the ultra-low latency 10 Gigabit Ethernet (10GbE) and 40GbE S4810 switches, provide

Open Cloud Networking:
High-performance, agile data center architectures

The recent acquisition of Force10 Networks by Dell melds open, standards-based networking resources with servers, storage, and services spanning a wide range of infrastructure planning, deployment, and management options for data centers in the virtual era. By standardizing the network framework, IT organizations can deploy open configurations that help simplify problem resolution and upgrades for optional scalability and performance—without locking themselves into proprietary architectures. Designed to deliver an open networking layer for scalable, flexible cloud computing environments, the Dell Force10 data center networking portfolio offers comprehensive core, aggregation, and top-of-rack switches:

- Dell Force10 E-Series® core chassis systems
- Dell Force10 Z-Series distributed core systems
- Dell Force10 C-Series chassis-based aggregation systems
- Dell Force10 S-Series top-of-rack access systems
- Force10 Operating System™ (FTOS)

Key attributes of Dell Force10 Open Cloud Networking include:

- High-density, line-rate Gigabit Ethernet (GbE), 10 Gigabit Ethernet (10GbE), and 40GbE connectivity
- Open, standards-based Layer 2 and Layer 3 feature sets
- A robust OS consistent across Dell Force10 platforms
- Industry-standard command-line interface (CLI) and graphical user interface (GUI)
- Integrated Open Automation (OA) software framework

Organizations can integrate Dell Force10 networking into a variety of data center architectures, installations, and deployments to enable open, standards-based networking for cloud computing environments of any size.

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feature-rich Gigabit Ethernet (GbE) and 10GbE connectivity for servers and storage elements. A robust control plane runs a variety of standard Layer 2 and Layer 3 protocols including Open Shortest Path First (OSPF), Intermediate System to Intermediate System (IS-IS), Border Gateway Protocol (BGP), Spanning Tree Protocol (STP), and others. Additionally, the Force10 OS (FTOS) that powers these platforms is designed to provide leading-edge, scalable, and reliable software that helps ensure high performance and maximum uptime.

Meeting the requirements of virtualization
While the growing adoption of virtualization enables enterprises to become increasingly responsive to business and organizational needs, it also adds complexity to data center management. For example, IT organizations are often required to manage hundreds or thousands of virtual machines along with their associated storage and networking resources.

As a result, data center infrastructures require increasing levels of management agility to quickly adapt to changes in application requirements. Server, storage, and network infrastructures can no longer be managed effectively as separate silos. Instead, they must be managed in a single, dynamic environment. Dell Force10 addresses these challenges through industry-standard technologies, rich network automation and virtualization software, and close collaboration with virtualization software providers, including VMware, Microsoft, Citrix, and Red Hat. In addition, this approach fosters continuing innovation in meeting IT requirements.

Delivering open, standardized platforms and integration
By mixing and matching servers, storage, and networking in a cloud computing environment, IT organizations can reap the benefits of open architectures, open automation, and open ecosystems. Cloud computing is rapidly gaining acceptance as an efficient model for delivering compute resources with high agility while helping to reduce management costs. To attain these benefits, cloud computing systems must provide the flexibility organizations need to meet their specific requirements.

The Dell Force10 Open Cloud Networking framework delivers advanced networking combined with flexible, open-automation software that frees IT organizations from the restrictions of proprietary architectures. Infrastructures comprising Dell servers and storage combined with Dell Force10 networking offer exceptional performance in an open framework that enables three essential ingredients for efficient cloud computing environments: data center architectures driven by the needs of the organization, tight integration among data center layers, and a broad ecosystem of hardware, software, and services.

Dive deeper: Open Cloud Networking
Visit the Dell Force10 Data Center Network channel to discover how networking innovations can advance IT flexibility and business agility. Learn more about switching and routing for high-performance computing to accelerate enterprise-scale, mission-critical operations.

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Figure 1. Evolution of the IT environment from closed to open systems

![Evolution of the IT environment from closed to open systems](image)

Author
Jeffrey Baher is senior director of data center networking product marketing at Dell and has nearly 20 years of experience in the networking industry.

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