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Brocade CMO John McHugh explains how Brocade® data center fabrics provide the high-performance, scalable, and reliable foundation required for highly virtualized environments and a full range of private, public, and hybrid cloud models.

## Increasing Business Agility through Cloud-optimized Networks

**Brocade data center fabrics provide a proven foundation for all types of cloud computing models.**

### **EXECUTIVE SUMMARY**

With the advent of virtualization, the maturation of “cloud” applications and services is well underway and will likely continue for at least the next decade. At the center of this movement is the network infrastructure, which plays an integral role in enabling the transformation of IT to a more efficient and flexible model built on cloud computing.

Brocade is leading this transformation by helping organizations around the world build cloud-optimized networks that increase business agility and profitability. Offering robust yet flexible network solutions, Brocade enables organizations to choose the best type of cloud model for their unique business requirements and objectives.

## THE BROCADE ONE STRATEGY

- » Unmatched simplicity through innovation
- » Investment protection through open architectures and greater choice
- » Higher performance through application optimization
- » Non-stop networking operations through higher resiliency and reliability

Fabric-based network architectures are the foundation for the cloud.

## THE NETWORK IS THE DATA CENTER

As more organizations implement cloud computing, the key characteristics of their networks—such as simplicity, uptime, and reliability—ultimately define application performance and the end-user experience, two of the key objectives of the cloud. Moreover, because the cloud is an end-state where applications and information reside anywhere—and are accessible at any time—the underlying network infrastructure has to be optimized for the cloud at every point.

This includes every point where computing devices exist, inside or outside the data center, connected to a network that provides the same high reliability and performance typically associated with the data center. For an increasingly distributed world, *the entire network is the data center*.

As the leading provider of fabric-based data center solutions, Brocade has over 15 years of experience in building mission-critical networks for some of the world's most demanding IT environments. With a strong heritage in both data center and IP networking, Brocade uniquely delivers solutions that are capable of providing data center-class capabilities across the entire network. This unmatched expertise helps organizations extend their data center assets and services from the desktop to the mobile user community around the world—a key step in the migration to the cloud.

## SIMPLIFYING THE MIGRATION TO THE CLOUD

One of the most compelling reasons for migrating to the cloud is greater agility in an increasingly dynamic business environment. Brocade is fully committed to helping organizations transition smoothly to a world where applications and information reside anywhere. Achieving this objective requires a network that reduces complexity, supports distributed applications, and enhances overall performance.

The guiding principle behind this movement is the Brocade One™ strategy, an innovative approach to networking based on:

1. Delivering **unmatched simplicity** by removing architectural complexity and reducing operational costs
2. Providing new levels of network scalability, uptime, and performance through **non-stop networking**
3. Supporting current and future applications that run on the network through **application optimization**
4. Delivering **investment protection** with best-in-class solutions and greater choice through an open, multivendor network architecture

## CLOUD MODELS: PRIVATE, PUBLIC, AND HYBRID

Building a cloud-optimized network that spans multiple IT architectures and applications can help organizations solve a wide range of business challenges. However, they first need to understand their particular challenges (and goals) before they can decide what type of cloud makes the most business sense. Today, there are three primary types of clouds: private clouds, public clouds, and hybrid clouds.

## Private Clouds

A private cloud is an infrastructure operated solely for a particular organization, managed by either that organization or a third party. Private clouds typically include pools of compute, network, and storage resources that allow organizations to provision and decommission applications and workloads on demand—all within the secure confines of an enterprise data center.

Virtualization is the driving factor for the migration to private clouds, with the level of virtual workloads correlating directly with an organization's readiness to implement private clouds. A fundamental requirement for supporting this type of private cloud model is the deployment of fabric-based networks that simplify data center virtualization. To meet this need, Brocade offers a comprehensive family of both Fibre Channel SAN and Ethernet fabric solutions that are purpose-built to enable virtualization and cloud computing.

## Public Clouds

A public cloud is an infrastructure made available to the general public by a service provider offering cloud services. Public clouds are transforming the way service providers deliver IT services to their enterprise customers. This transformation represents such a fundamental change in the service provider business and revenue-generation models that *the network essentially is the cloud*. Because Brocade provides solutions for both enterprise data center and service provider network infrastructures, it uniquely understands how to help service providers meet their enterprise customers' growing needs in a cost-effective manner.

## Hybrid Clouds

A hybrid cloud is a combination of two or more clouds (private or public) that remain unique entities but are bound together by technology that enables data and application portability. In this way, hybrid clouds bridge the private and public cloud models, enabling a customized, pragmatic, and logical way to deploy cloud capabilities that leverage both private and public resources as appropriate.

One key aspect of an effective hybrid cloud strategy is that organizations can enjoy the same level of application performance and availability to which they are accustomed, even as their data traverses the private and public cloud environments. Brocade enables this approach through industry-leading network, data center extension, and application load-balancing capabilities.

## PRIVATE CLOUDS: A CLOSER LOOK

Having designed data center fabric technologies for more than 15 years, Brocade offers a comprehensive solution portfolio that leverages proven technologies such as Fibre Channel and emerging technologies such as standards-based Ethernet fabrics. This expertise is critical for developing flatter, multipath, deterministic networks that are designed for highly virtualized data centers. This design approach increases network utilization, improves resilience, simplifies management, and provides virtual machines with a greater sphere of mobility.

The Brocade VDX™ 6720 Data Center Switch, featuring Brocade VCS™ technology, is the foundation for the industry's first true Ethernet fabric solution that simplifies operations and extends data center capabilities to optimize the entire network for the cloud.

## CLOUD MODELS

- » Private cloud: An infrastructure operated solely for a particular organization, managed by either that organization or a third party.
- » Public cloud: An infrastructure made available to the general public by a service provider offering cloud services.
- » Hybrid cloud: A combination of two or more clouds (private or public) that remain unique entities but are bound together by technology that enables data and application portability.

**The network plays an integral role in the transformation to cloud computing.**

**Hybrid clouds promise to deliver tangible benefits of both public and private clouds.**

In addition to pioneering Ethernet fabrics, Brocade continues to be the innovation leader in Fibre Channel SAN fabric technology. As the only company offering a complete family of 16 Gbps Fibre Channel storage networking products, Brocade sets the benchmark for SAN performance, simplicity, and security. This continued innovation and investment protection is critical, because Fibre Channel technology continues to be the top choice across the industry for highly virtualized storage environments.

These environments require ultra-reliable, high-performance, and field-proven technology to meet the needs of dynamic applications and workloads. The Brocade 16 Gbps Fibre Channel family is uniquely designed to support a wide variety of data center technologies, such as solid state disks, Virtual Desktop Infrastructure (VDI), deduplication, and more.

### **PUBLIC CLOUDS: A CLOSER LOOK**

Public clouds typically refer to cloud-based services (often IP communication services) delivered by service providers to their enterprise customers. In the future, service providers will increasingly deliver virtual private cloud services to their enterprise customers. For instance, instead of building their own private clouds, enterprises can utilize a cloud built on the service provider's infrastructure and securely shared among multiple enterprise customers.

The public cloud is transforming service provider business models and the way they deliver services to enterprise customers. As basic connectivity and transport services quickly become a commodity, the public cloud model enables new revenue-generating services while keeping operating costs low. Service providers can also dramatically expand their services by connecting their data centers to their enterprise customers' data centers to offer greater scalability and integrated services through hybrid clouds.

In addition to providing basic networking services to their enterprise customers, service providers also want to deliver application-level services from the data center. Because Brocade offers network solutions for both data center and service provider network infrastructures, it uniquely understands how to enable this type of business model in a cost-effective manner:

- Brocade has strategic relationships with the leading compute, server, and storage companies, so the required ecosystem is already in place to build best-in-class, standards-based virtualized data centers for public cloud services today.
- Brocade network solutions provide industry-leading scalability and performance, helping service providers leverage innovative technologies, such as Ethernet fabrics, to offer public cloud services.

Brocade is a true partner to both service providers and their enterprise customers, helping to define open industry standards for cloud-optimized networks:

- Brocade is actively working with several cloud interoperability standards bodies, including the Open Networking Foundation and OpenStack, on a set of standard APIs to better control network behavior.
- By implementing OpenFlow standards, Brocade network solutions dramatically simplify hyper-scale data centers, cloud infrastructure management, and the way applications can be optimized for maximum performance.

## HYBRID CLOUDS: A CLOSER LOOK

While there is currently much debate around the adoption and benefits of public and private clouds—with proponents on each side—hybrid clouds promise to deliver tangible benefits of both public and private clouds:

- Private clouds provide greater control since they can be firewalled from the Internet for increased security and performance, but they might be cost-prohibitive if applied across the entire infrastructure.
- Public clouds provide elastic, cost-effective computing capabilities that help organizations to easily scale up or down, but they might lack the security, control, and compliance reporting capabilities required for mission-critical applications.
- Hybrid clouds enable a customized approach, representing a pragmatic and logical way for organizations to deploy specific cloud capabilities for particular applications or workloads.

When organizations have applications or workloads running within their own data center, as well as a portion running in a public cloud as an extension of their data center, it is considered a hybrid cloud. This model is an increasingly viable option for many organizations, and will be even more so as technologies and the industry continue to evolve.

For that to happen, organizations must be able to expect the same level of performance and availability when their data is traveling between public and private clouds as they are accustomed to within the confines of their own data centers. Brocade network solutions enable this highly effective level of data center-to-data center connectivity in multiple ways:

- At a fundamental networking level, Brocade Multiprotocol Label Switching (MPLS) and Virtual Private LAN Service (VPLS) technologies provide reliable interconnectivity between private clouds and public clouds.
- From an application delivery perspective, Brocade solutions enable server load balancing across different public clouds or multiple sites beyond the data center on a global scale.
- Brocade also facilitates the transfer of workloads from an organization's own data center to the public cloud. This requires the movement of not only the compute or application aspect, but also the data and storage associated with the application.

These technology advances are transforming the way organizations design their data centers. The advent of the hybrid cloud model essentially frees them from having to build their own data centers from the ground up. The hybrid cloud model also provides an unprecedented level of business agility, with a comfort level that helps organizations retain control over their data assets while extending to the public cloud in a secure, high-performance manner when it makes sense to do so from a business perspective.

## THE RIGHT NETWORK FOR THE CLOUD

When it comes to cloud computing, the network is the fundamental enabling technology regardless of cloud model. With deep expertise in data center fabrics—both Fibre Channel and Ethernet fabrics—Brocade understands the full range of requirements for cloud computing. This makes Brocade the right choice for any organization that is considering or has already implemented cloud capabilities.

Today, Brocade network solutions enable organizations to choose the right cloud model based on their particular workloads and business requirements (such as cost, performance, and security). As a result, organizations can leverage a comprehensive family of products, services, and solutions to help build highly scalable, highly resilient cloud-optimized networks.

To learn more, visit [www.brocade.com](http://www.brocade.com).

**For service providers, the network *is* the cloud.**

**The public cloud is transforming the service provider business model.**

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