THE BROCADE
DATA CENTER FABRIC

White Paper
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Abstract

As today's IT organizations face an increasing number of internal and external business requirements, they must ensure that their data centers become a strategic asset for their continued growth and expansion. Pressures to reduce cost and improve agility in an atmosphere of unprecedented data growth—combined with accelerated adoption of server virtualization—are driving the transformation of enterprise data centers. At the center of this transformation is an underlying need to consolidate, evolve, and automate the data center infrastructure.

This paper describes the key issues facing IT organizations today and explains how the Brocade® Data Center Fabric (DCF) provides an architectural foundation and evolutionary strategy for transforming today's IT infrastructures into next-generation data centers with reduced cost, increased flexibility, and minimized risk.

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The Transformation of the Data Center Fabric

A variety of new and emerging business requirements are raising the bar on what today's IT organizations expect from their technology infrastructures, fueling an ongoing transformation of their data centers. Some of the fundamental business drivers behind this transformation include the need to:

- Optimize resource utilization to reduce cost
- Increase the amount of digital information assets organizations can leverage for a competitive advantage
- Simplify application deployment and data management to keep up with the speed of business transformation

Today's competitive business environment demands that applications are continuously available and that all data is accessible, protected, and managed at the lowest possible cost. This is a growing challenge, especially as the amount of information being converted into digital data continues to rise. Moreover, global competition means that business strategies are more dynamic as supply chains become more flexible and regional variations in products and processes are required to gain a competitive advantage.

Unfortunately, today's data centers are hard-pressed to keep up with the rate of growth in digital data and the pace of application deployment. This is especially challenging as organizations attempt to turn their data centers into strategic assets. Because of the unprecedented growth of digital data, infrastructure performance, availability, and scalability have become essential to success. And, with the mandate to reduce risk and complexity, organizations need infrastructure components that are more tightly integrated under a common management framework.

As a result, enterprise data centers are undergoing a distinct architectural transformation (see Figure 1). Important elements of the new data center architecture include:

- Consolidation of physical resources into shared resource pools
- Replacement of rigid, physical connections between applications and data with dynamic, virtual connections using virtual servers and storage
- Enhanced data mobility, protection, and security
- Improved cost and energy efficiency

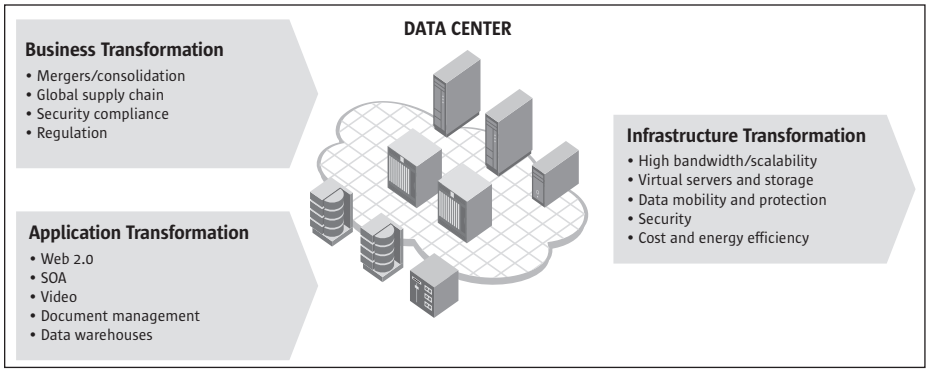

Figure 1. The key factors driving data center transformation

Key Requirements for Infrastructure Transformation

As business requirements continue to change, organizations need highly flexible IT infrastructures that are capable of meeting rising scalability and performance demands. Because most organizations have invested millions of dollars in their enterprise data centers, they must be able to leverage their existing assets as they build their next-generation fabrics. To reduce Total Cost of Ownership (TCO), the data center fabric must support unified management of applications, files, storage, and servers in a non-disruptive manner. It must also be efficient in regard to power and cooling. And any transformation must be evolutionary, not a revolutionary and risky "rip-and-replace" overhaul.

A fundamental guiding force behind data center transformation is consolidation, first enabled through storage consolidation and wide utilization of Storage Area Networks (SANs). Today, server consolidation, fueled by the capabilities and cost savings of server virtualization, is requiring a fundamental change in fabrics supporting hundreds to thousands of virtual machines. And to achieve even greater management and energy efficiencies, organizations need to consolidate smaller SANs into ever-larger SANs.

The core of the data center requires a highly connected fabric that is reliable, secure, and adaptive to change. It must be optimized to facilitate and support expanding virtual server environments. It must leverage intelligence in the fabric to provide services with increased application awareness. Finally, it must provide a high degree of automation based on application-driven policies (see Figure 2).

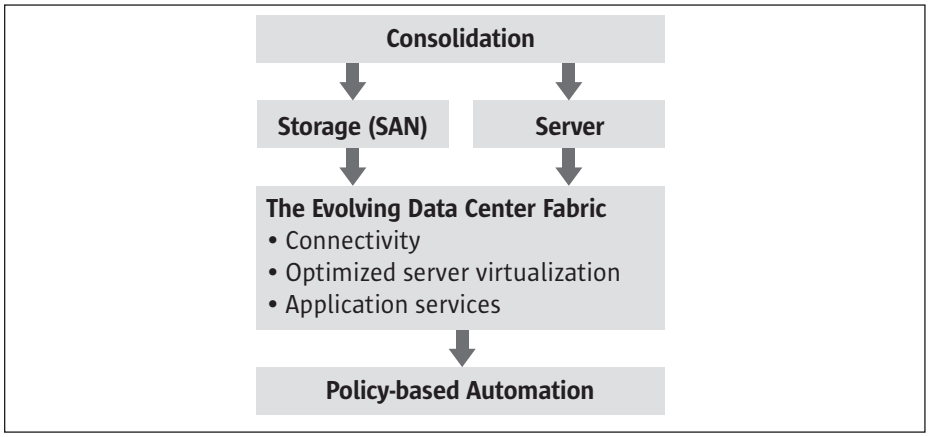

Figure 2. The evolving data center fabric

Broad connectivity

At a minimum, next-generation data center fabrics must have more scalable connectivity. Many organizations have already begun to deploy enterprise-class virtual servers running applications that traditionally have not been connected to shared networks. As a result, these applications are driving the need for a much larger fabric that requires greater connectivity, scalability, and performance. These applications rely upon the underlying fabric and shared resources for key services such as bandwidth management and partitioning.

Optimized server virtualization

The underlying fabric must also be capable of optimizing server virtualization in regard to rapid data access and application mobility—as applications increasingly move across virtual servers and infrastructure, the data center infrastructure must readily support this type of movement. To provide seamless access to shared storage resources and network services, server virtualization will also require end-to-end (server-to-storage) communication and management in the underlying fabric.

Application services

After deploying a fabric with much broader connectivity, higher performance, server virtualization, and layered partitioning for a unified management approach, organizations can deploy a wide range of intelligent application services. With the availability of "plug-in" services, the data center can utilize the fabric to offload server resources, thereby increasing data protection, data mobility, and end-to-end security.

Next-generation Data Center Fabrics

- Data-centric and application-aware
- Highly connected
- Consolidated
- Virtualized
- Intelligent and adaptive
- Efficient with unified management
- Secure to protect digital assets
- Energy-efficient

Policy-based automation

The fabric also needs to adapt to changing application workloads and automatically provision server and storage resources based on service level requirements and business/application policies. To ensure that the appropriate bandwidth and resources are consistently available, these policies must follow an end-to-end path from the application through the fabric to the storage. A policy-based architecture also helps enable a unified management, or "orchestration," layer for the fabric and its applications.

Implementing innovative and widespread policies requires tight integration with the broadest set of third-party management applications. This is critical for best-in-class solutions that support a wider range of automation possibilities while simultaneously helping organizations avoid vendor lock-in and business disruption.

The Brocade Data Center Fabric

To address the wide variety of requirements for next-generation data centers, Brocade has developed an architectural foundation and evolutionary strategy: The Brocade Data Center Fabric (DCF). This intelligent, policy-based architecture is designed to help organizations build the most efficient, cost-effective data center fabrics based on their particular business needs (see Figure 3).

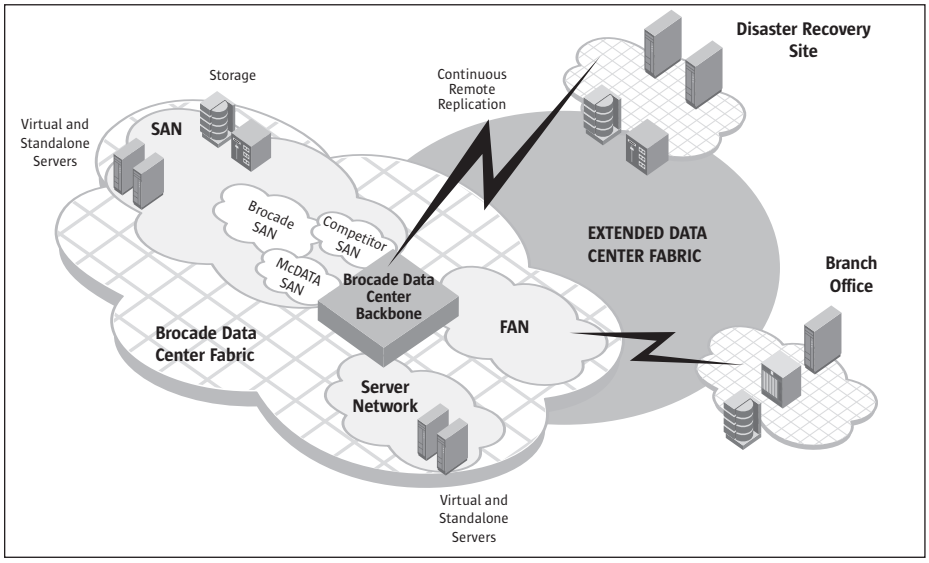

Figure 3. The Brocade Data Center Fabric and beyond

This unique approach incorporates a shared resource model that leverages a decade of Brocade experience in building low-latency, high-performance, enterprise networks. The Brocade DCF architecture encompasses the connectivity of applications and their data within data center environments. It includes file and block data; virtualized server and storage islands; and multiprotocol connectivity to meet evolving business requirements. Moreover, it enables unified end-to-end connectivity and management (server-to-server, server-to-storage, and storage-to-storage) to reduce complexity.

Organizations can utilize this infrastructure to solve key data management challenges, provide consistency across all types of applications, and reduce their overall operating costs. To facilitate continued expansion, the underlying infrastructure is specifically designed to adapt to changing business conditions and new technologies. Brocade provides the "enabling" layer—including multiprotocol connectivity, fabric and application services, and extension services—and leverages its strategic partner relationships for unified management (see Figure 4).

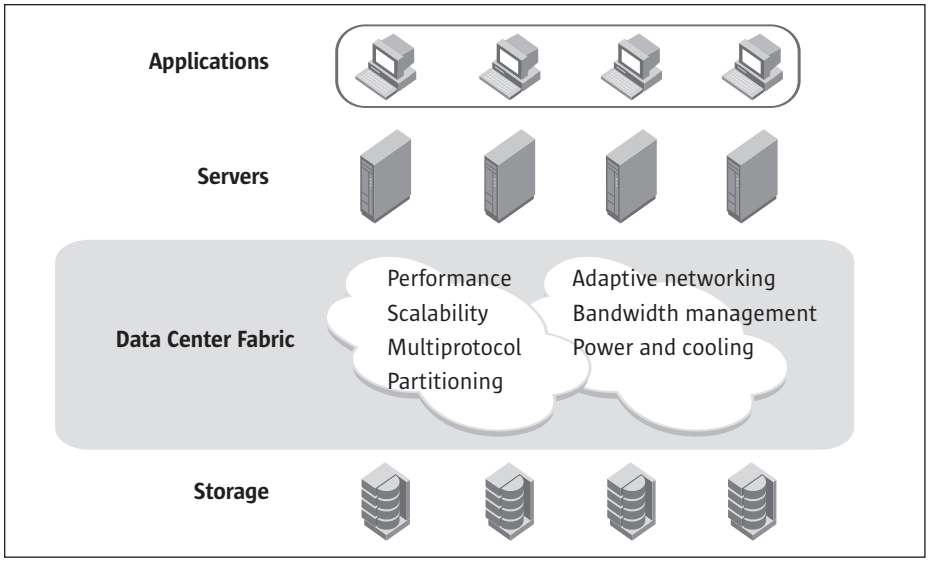

Figure 4. The core elements of the Brocade Data Center Fabric

Unique Advantages for the Brocade Data Center Fabric

Uniquely focused on applications and data, the Brocade DCF:

- Is an application- and data-centric (versus network-centric) foundation, delivering the highest levels of performance, scalability, and reliability
- Simplifies data center connectivity and reduces costs by collapsing storage networking and server-to-server clustering into a single, converged infrastructure
- Adapts to the dynamics of virtualized servers and storage while accommodating expanding application workloads and the relentless growth of corporate data
- Provides "plug-in" services that leverage intelligence in the fabric and offload server resources to increase protection, provide data mobility, virtualize storage, and enhance security
- Helps ensure continuous data availability, including reliable distance extension for remote access, mobility, and disaster recovery
- Supports a common management framework utilizing best-in-class Brocade and third-party tools across block, file, and other data types
- Protects and extends existing IT investments with interoperability for non-disruptive growth and expansion

A cost-effective approach for ongoing investment protection

At its foundation, the Brocade strategy avoids expensive and risky "rip-and-replace" data center upgrades by providing built-in investment protection. As a future-built, flexible, scalable, and multiprotocol framework, the Brocade DCF architecture is designed to incorporate new technologies over time. Organizations can utilize their existing equipment and processes, choosing how and when to upgrade their fabrics in the most efficient manner.

This architecture supports forward and backward compatibility with existing Brocade solutions as well as interoperability for all types of SAN environments, including those from other vendors. And it enables organizations to manage server and storage connectivity for both block and file data under a common fabric management framework, helping to reduce costs and complexity while addressing compliance concerns.

A future-built, strategic solution

Brocade solutions already provide the building blocks for high-performance, high-quality data center networks. These solutions play a significant role in the Brocade DCF architecture strategy by facilitating non-disruptive storage, server, and network consolidation. This strategy features:

- Industry-leading power and cooling efficiency
- Increased utilization of shared resources
- Greater flexibility with advanced partitioning and routing technologies
- Adaptive networking

Brocade differentiates its approach through high performance, scalability, bandwidth management, virtualization, and multiprotocol connectivity—including the use of the new Fibre Channel over Ethernet (FCoE) standard. The application-driven architecture helps ensure that applications receive their required resources in order to maintain Quality of Service (QoS) and Service Level Agreements (SLAs).

The Brocade DCF architecture helps optimize virtual server environments through end-to-end connectivity and management while enabling fabric-based services, including:

- Continuous data protection and disaster recovery
- File and block data migration across heterogeneous environments and between sites
- Virtualized heterogeneous storage
- Encryption for data in-flight and at-rest

By being application-aware, the Brocade DCF architecture accommodates a broader range of automation across the data center fabric. As a result, organizations can create advanced policies to support a wide range of strategic initiatives. This is critical for improving administrative productivity and avoiding resource-intensive tasks inherent in growing, dynamic data centers.

File Area Networks (FANs)

Unstructured data now accounts for more than 80 percent of digital information generated worldwide. The Brocade DCF architecture extends beyond high-performance block-based SAN fabrics to provide storage management and data mobility at the file level.

Brocade FAN solutions enable data centers to provide centralized, policy-driven management of file data residing at all points of the enterprise. Organizations can migrate file data from remote sites and consolidate it in the data center without disrupting user access. This approach reduces overhead while utilizing storage resources much more efficiently. Organizations can also replicate data from remote locations to the data center for centralized backup, disaster recovery, and failover to improve business continuity.

End-to-end connectivity

The Brocade DCF architecture provides unified, end-to-end connectivity. Advanced Brocade Host Bus Adapters (HBAs) extend intelligence to servers, enabling applications to “move” across virtual environments without interrupting data access or impacting users. This enables faster and more efficient I/O streams, policy-based QoS, and fabric-based services—including data migration, protection, and encryption—to address the varied needs of specific applications.

The Brocade Advantage

- **High performance:** Higher bandwidth and faster time-to-market with innovative technologies
- **High reliability:** Highly available systems and proven quality leadership
- **Low costs:** A simplified architecture, ease of management, and investment protection for low TCO
- **Low risk:** Forward and backward compatibility, reduced complexity, proven interoperability, and the most integrated solutions
- **Evolutionary:** Investment protection with a clear migration path rather than a "rip-and-replace" approach
- **Best in class:** Brocade enabling technology along with the broadest partner ecosystem for unmatched flexibility and choice

Brocade DCX: The Data Center Backbone

The performance demands of next-generation data centers, combined with ongoing cost reduction pressures, can strain the capabilities of conventional switch and director-class fabric architectures. Today, Brocade solutions provide unmatched performance, five-nines reliability, network-based services, and industry-leading energy efficiency. However, the requirements for large-scale server virtualization, widespread resource-intensive service delivery, adaptive networking, and multiple high-performance network protocols (HPC, SAN, DCE) ultimately require a new class of network infrastructure: the data center backbone.

Designed to meet these growing performance, scalability, and cost-efficiency requirements, the Brocade DCX™ Backbone complements any data center environment, providing the core foundation for the Brocade DCF. It features breakthrough performance, a highly robust services platform, seamless interoperability across fabrics and networking protocols, and future-built extensibility for next-generation data centers.

Summary

Brocade has unmatched expertise and a proven track record in developing industry-leading solutions for servers, storage, applications, and data in the world's largest data centers. Today, these solutions help organizations connect and manage their applications throughout enterprise data centers and beyond. With the Brocade DCF architecture, enterprise organizations now have a strategic framework for building their next-generation data center fabrics in the most flexible, cost-effective manner. To learn more, visit www.brocade.com.

Sun Microsystems, Inc. 4150 Network Circle, Santa Clara, CA 95054 USA **Phone** 1-650-960-1300 or 1-800-555-9SUN (9786) **Web** sun.com

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