



DATA CENTER

The Brocade DCX Backbone and the Evolving Data Center

The evolving data center requires innovative technology in the fabric networks that connect servers to servers, servers to storage, and storage to storage.

BROCADE

CONTENTS

The Evolving Data Center	3
The Brocade DCX Backbone	4
Consolidate Fabric Technology	4
SAN Convergence	5
Advanced Data Center Fabric Technology Integration	5
Provide Virtual Fabric Partitioning	6
Provide Application-Aware, Virtual Channels	6
The Brocade DCX Backbone Value Proposition	8
Features	9
Performance	9
Excellent Value	9
Expandable Platform for Advanced Technologies	9
The Brocade DCX Core Features	11

THE EVOLVING DATA CENTER

Data centers are being transformed from the static physical infrastructure of dedicated servers and storage hosting fixed applications, to a dynamic virtual infrastructure in which applications run on virtual servers. Virtual servers share compute resources and store data in virtual storage pools, across which data is automatically migrated over its life cycle. This transformation is in response to the relentless growth in digital data, Web applications, and the demands of a global supply chain. To keep up, evolving data centers have to dramatically increase the utilization of physical server and storage assets, while at the same time simplifying infrastructure provisioning, management, and fault isolation. Brocade believes that this transformation will be accomplished by evolving technology investments and not by the wholesale "rip and replace" of existing Storage Area Network (SAN) components.

Virtualization brings increased utilization of data center assets, which in turn results in reduced requirements for power, cooling, and floor space—all of which are becoming scarcer and more expensive. Two innovative technologies, virtual servers and virtual storage, are essential for this transformation, but they introduce new complexity and require a new architecture for data center networks.

Evolving data center networks require extraordinary levels of availability, bandwidth, scalability, and low end-to-end latency. Infrastructure upgrades and configuration changes must be non-disruptive and avoid application outages—and these requirements become more challenging in a virtualized environment. Applications and their data dynamically move across the physical infrastructure, requiring deeper network intelligence to ensure that network resources are allocated efficiently and not depleted as workloads shift. The evolving data center requires innovative technology in the fabric networks that connect servers to servers, servers to storage, and storage to storage.

NOTE: Throughout this document, the terms “Brocade DCX Backbone” or “Brocade DCX” refer to both the Brocade DCX and the Brocade DCX-4S Backbone unless otherwise noted. In illustrations, the Brocade DCX is shown to represent both backbone platforms.

The Brocade® data center fabric reflects our strategy in the evolving data center:

- This technology strategy transforms our current SAN technology portfolio into extraordinary networks with an intelligent edge to optimize data center connection of virtual servers and storage, and to consolidate network traffic over a high-speed core.
- The Brocade DCX® Backbone can be added non-disruptively to existing SAN environments, so that existing assets can be used until the end of their useful economic life without the risk and cost of "rip and replace" technology upgrades.
- Fabric management connects its deeply integrated, application-aware fabric intelligence to virtual server workload management, provisioning, and capacity-planning tools provided by Brocade and our partners.
- Data mobility uses a scalable fabric application platform for integrating storage virtualization and replication applications and Brocade Data Migration Manager (DMM).
- Benefits include integrated, simple management, lower operating costs, and dynamic fabric provisioning to match the speed of business innovation.

NOTE: For descriptions of Brocade enterprise-class platforms and the embedded switches that they support, see the appendix in the Brocade Architecture Brief, “Selecting a Long-Term Director Strategy.”

THE BROCADE DCX BACKBONE

The Brocade DCX Backbone is at the core of the fabric in evolving data centers. It is the first of a new generation of advanced data center fabric platforms and seamlessly integrates with existing Brocade SAN directors and switches. It is designed to:

- Consolidate fabric technology (Layer 2 and Layer 3 Fibre Channel, Layer-2 Ethernet and extension) and extend it to virtual servers, virtual storage, and remote data centers
- Integrate virtual connections to attach virtual servers to virtual storage across multiple protocols using the Brocade virtual channel technology, shown in Figure 1.
- Integrate fabric partitioning for flexible management using the Brocade Virtual Fabric (VF) technology
- Integrate an intelligent edge with application-aware service levels using Brocade Adaptive Networking services across a high-speed core
- Integrate a fabric application platform for non-disruptive scalability and consolidation of data movement applications (replication, migration, virtual storage, and so on)
- Integrate fabric-hosted encryption services for disk and tape (storage) data-at-rest protection
- Integrate intelligent fabric management services with virtual server provisioning, application-aware service levels, and virtual storage data-protection policies.

Consolidate Fabric Technology

The Brocade DCX delivers high port count (384 ports per chassis or 768 ports with Inter-Chassis Links (ICLs) between two chassis), significant bandwidth (6-Tbps switching engine) with non-disruptive scalability. It integrates current and advanced technologies onto a single platform:

- Fibre Channel at 1, 2, 4, 8, and 10 Gigabits per second (Gbps) with application-aware Adaptive Networking services
- FICON at 1, 2, 4, 8, and 10 Gbps
- FCIP, Ethernet, FCIP with storage-optimized TCP/IP extensions at 1 and 10 Gbps
- 1, 2, and 4 Gbps fabric application platform for data movement applications (replicate, migrate, virtual storage)
- 8 Gbps, per-port SAN Integrated Routing
- 10 Gbps Converged Enhanced Ethernet (CEE)
- 10 Gbps Fibre Channel over Ethernet (FCoE)
- 10 Gbps Ethernet for FCIP extension services
- Integrated data encryption engine

To summarize, the Brocade DCX Backbone consolidates server-to-storage, server-to-server and storage-to-storage extension traffic onto a common fabric network. It delivers performance, while boosting resource utilization, reducing operating cost and capital expense, and simplifying end-to-end management.

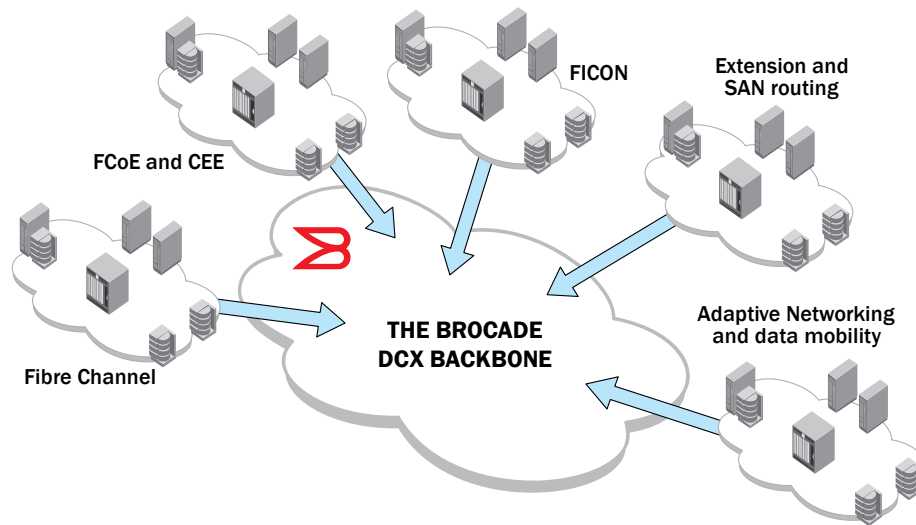


Figure 1. The Brocade DCX Backbone consolidates current and future technology.

SAN Convergence

The Brocade DCX Backbone can seamlessly connect to legacy SANs using the M-Enterprise OS (M-EOS)-based McDATA 6064, Brocade M6140, and Brocade Mi10K Directors and switches; and the Fabric OS® (FOS)-based Brocade 48000 Director and switches. There are two approaches for SAN convergence: fabric mode and SAN Routing. The Brocade DCX integrates M-EOS native and open fabric modes and SAN Routing (M-EOS native and open and FOS).

A compelling benefit of the Brocade DCX for M-Series SAN customers is the ability to non-disruptively add the Brocade DCX application platform to M-EOS SANs for storage virtualization, replication, and Brocade Data Migration Manager (DMM). Fabric applications can be integrated without replacing existing M-EOS SAN directors or switches. The Brocade DCX integrates the same scalable application platform (running at 4 Gbps in both the Brocade 48000 and the Brocade DCX).

NOTE: For use case scenarios describing how to transform M-Series fabrics to add the Brocade DCX, see the Brocade Technical Brief, “Brocade DCX Integration for Brocade M6140 and Mi10K Customers.”

Advanced Data Center Fabric Technology Integration

The Brocade DCX Backbone adds advanced data center fabric technology. It can be non-disruptively integrated into existing B-Series fabrics (running FOS) or M-Series fabrics (running M-EOS). Note that the Brocade technology strategy has always taken into account asset utilization for its full economic life and continues to do so.

Brocade Adaptive Networking services in FOS provide application-aware intelligence. Adaptive networking includes several new services—Quality of Service (QoS), Traffic Management, Fabric Dynamic Profiling, and Resource Recovery—essential tools for ensuring application service levels are met as applications dynamically move between virtual servers.

Provide Virtual Fabric Partitioning

IT operation and administration functions have to match organization structure, budget constraints, and business priorities. In addition, applications have different service level requirements, which strongly influence their management and support policies. Brocade Virtual Fabrics partitioning allows administrators to flexibly define management domains, reflecting application service levels, organizational dynamics, and business priorities, as shown in Figure 2. Physical switches are logically partitioned into Logical Switches, each belonging to a Logical Fabric. Virtual Fabrics logically isolates data flows, fabric control and fabric management when enabled on supporting physical hardware.

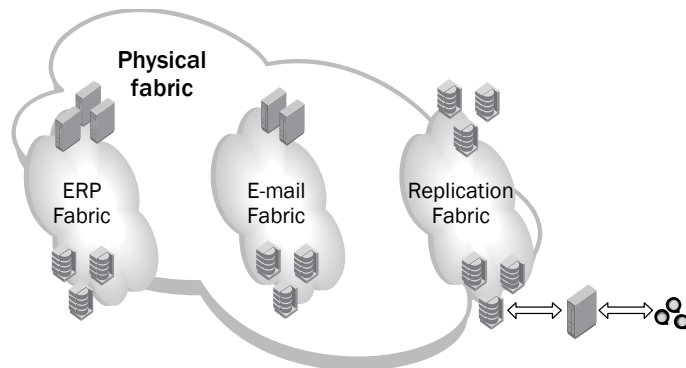


Figure 2. Virtual Fabrics partitioning flexibly align management with business priorities.

Provide Application-Aware, Virtual Channels

Increasingly, applications are dynamically provisioned on virtual machines using server virtualization software. And virtual storage applications automatically move data from one storage tier to another as access patterns and data retention policies dictate. This virtual infrastructure means that shifting application workloads along with data migration can create unexpected demands on traditional fabrics, causing unpredictable congestion. Provisioning, configuration management, capacity planning, security, and fault isolation become more complex in a virtual environment. The solution is to integrate these tools into fabric management.

The Brocade DCX Backbone technology enables features such as Brocade virtual channels and Adaptive Networking services. Today, virtual channels add logical data paths to Inter-Switch Links (ISLs). Using our intelligent Host Bus Adapters (HBAs) and Converged Network Adapters (CNAs), virtual channels extend to the virtual machine and its applications. The virtual machine can assign data flows between virtual servers and storage to virtual channels, which are associated with a QoS priority (high, medium, low) end to end across the fabric, as shown in Figure 3. As applications move from one virtual server to another, the Brocade Adaptive Networking services maintain the priority required by the application's workload. QoS priorities can be flexibly applied at the virtual fabric, physical port, and/or data flow (initiator, target) level.

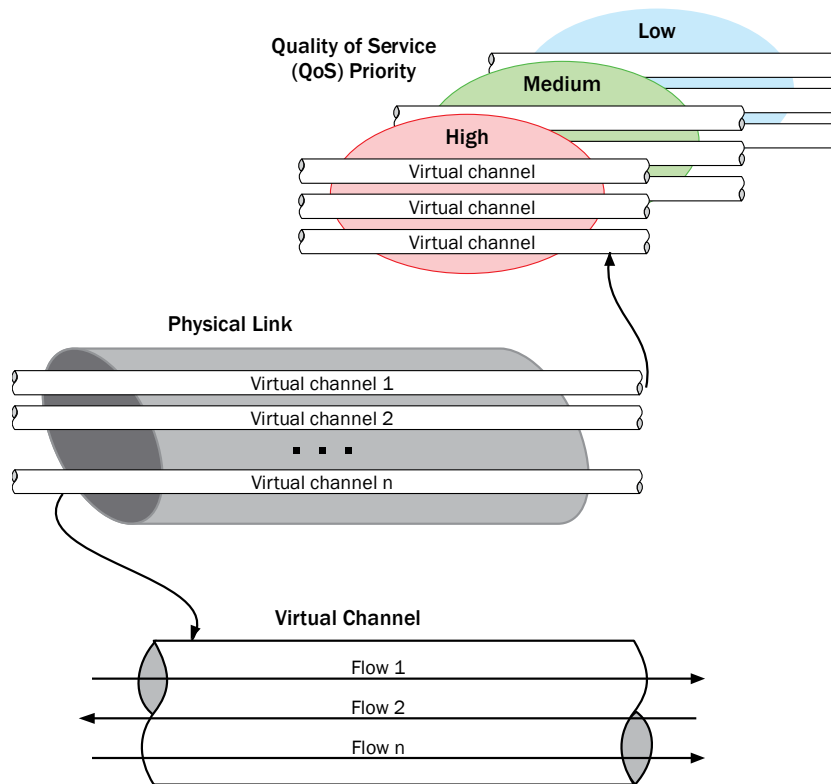
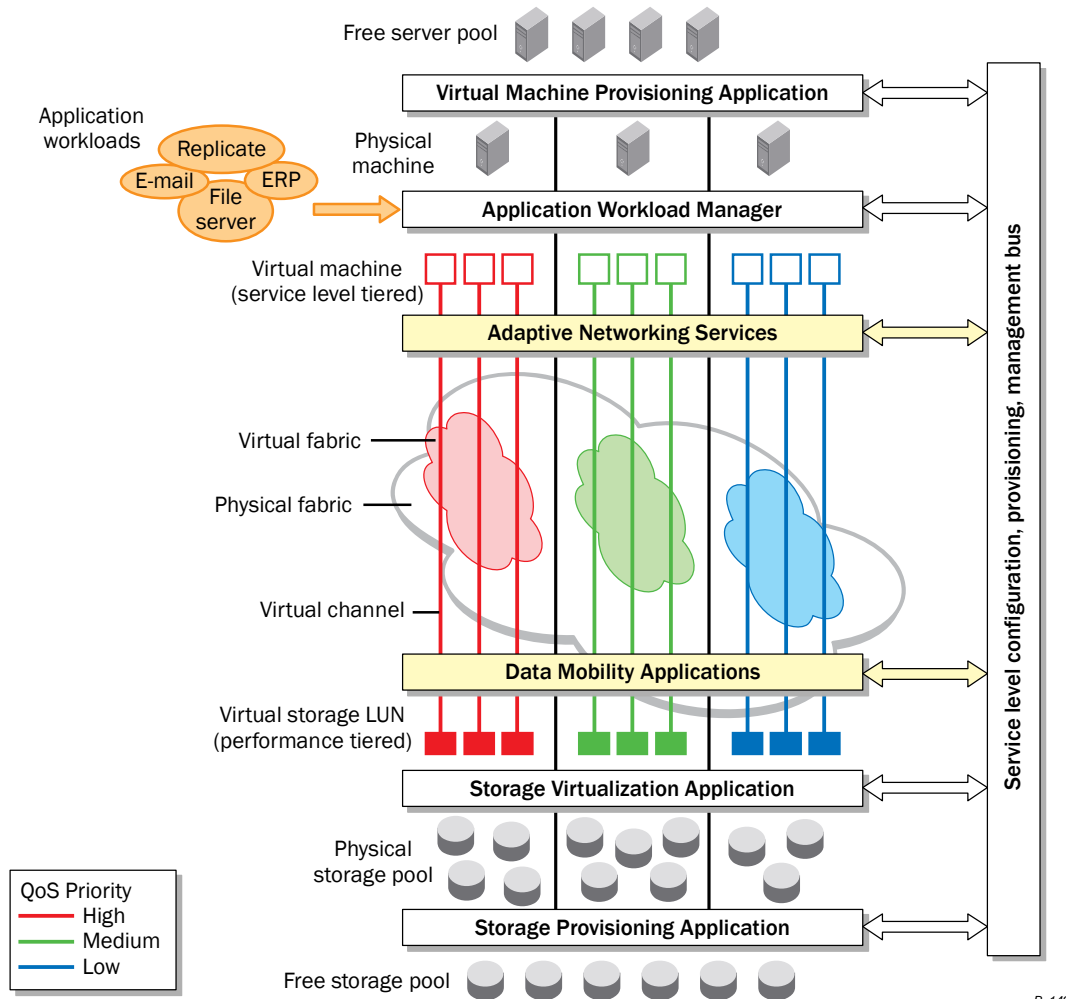


Figure 3. Virtual channels integrate application-aware QoS.

As workloads move, Adaptive Networking monitors physical fabric resource use. If congestion occurs or is about to occur, special queue management and rate limiting algorithms avoid the congestion or eliminate it.

Fabric complexity due to growth and the use of virtual servers and storage make performance management essential. Brocade's Adaptive Networking services includes Fabric Dynamic Profiling, which identifies the applications that are consuming the most bandwidth and the potential congestion points anywhere in the data path. It also provides historical statistics to support capacity planning. For example, the "Top Talker" profile shows which applications consume the most bandwidth per port, providing guidance for tuning fabric performance.

Resource recovery can detect depleted buffer credits (the flow-control mechanism) and "slow-drain" devices to prevent resource exhaustion and application disruption. Figure 4 illustrates how these advanced technologies work together in the Brocade data center fabric.



B_149

Figure 4. The Brocade data center fabric implements application-aware service levels with data mobility policies

THE BROCADE DCX BACKBONE VALUE PROPOSITION

The Brocade DCX Backbone delivers a new class of fabric infrastructure, providing the high-performance, non-disruptive scalability and continuous availability necessary for converged data center fabrics. The Brocade DCX accelerates the transformation of today’s physical data center into tomorrow’s virtual data center. The Brocade DCX delivers this performance at excellent value on an expandable technology platform designed to seamlessly add tomorrow’s advanced technologies.

Data center fabric infrastructure requires high performance at the core to support the convergence of workloads from server-to-storage, server-to-server and storage-to-storage extension on a common fabric. Adaptive networking ensures that the data center fabric can meet application service levels when workloads shift across virtual servers and when data is migrated between virtual storage tiers—cost effectively. Data movement applications leverage the performance of the Brocade DCX Backbone..

Features

The following sections highlights features of the Brocade DCX.

Performance

The Brocade DCX delivers the requisite performance to support the data center fabric:

- 3 Tbps switching performance with 6x the capacity of legacy SAN directors, delivering scalable, advanced fabric intelligence
- 8 Gbps Fibre Channel with 10 Gbps FCoE, CEE, and standard Ethernet
- 384 external ports per chassis, 768 external ports with ICLs in a dual-chassis configuration (Brocade DCX and DCX-4S chassis can be linked in a number of configuration options. See the *Brocade DCX Backbone Hardware Reference Manual* and the *Brocade DCX-4S Backbone Hardware Reference Manual* for details.)
- 8 Gbps local switching on up to 48 ports per blade, sufficient for even the most demanding application workloads

Excellent Value

The Brocade DCX delivers network flexibility:

- Protocol integration:
 - Fibre Channel at 1, 2, 4, 8, and 10 Gbps
 - FICON at 1, 2, 4, 8, and 10 Gbps
 - FCIP at 1 and 10 Gbps
 - FICON and open systems extension with storage optimized TCP/IP at 1 and 10 Gbps
 - Integrated SAN Routing at 8 Gbps
- Virtual channels and Adaptive Networking services, QoS ensures consistent performance for dynamic, virtual server workloads.
- Fabric application platform with 1, 2, and 4 Gbps FC and 1 Gbps
- Fabric consolidation with up to 4x the switching performance of legacy SAN directors and 10x greater power and cooling efficiency
- Non-disruptive scalability of SAN fabrics, with connection to existing M-EOS native and open fabric modes

Expandable Platform for Advanced Technologies

The following advanced technologies for data center fabrics are available to increase performance scalability and fabric intelligence:

- 8 Gbps, per-port SAN Routing
- 10 Gbps FCoE and CEE
- 10 Gbps FCIP extension services
- Protocol-independent Adaptive Networking services: Fibre Channel, TCP/IP, FCoE, CEE
- Integrated encryption engine for secure data at rest

- Converged Brocade DCX Backbone and SAN director management
- Virtual Fabrics for switch, fabric, and management partitioning

The Brocade DCX Core Features

The following lists features in greater detail:

- NTP V3
- SSH V2
- HTTPS
- Syslog
- RADIUS
- LDAP
- SCP support
- DH-CHAP (between switches and end-devices)
- FDMI
- SNMP V1, V3
- SMI-S Compliant
- SMI-S Scripting toolkit
- Role-Based Access Control (RBAC)
- IP Filter Support
- Port mirroring (SPAN port)
- Default zoning
- Port and WWN zoning
- Broadcast zoning
- Configurable RSCN management
- Change auditing
- Environment monitoring
- Non-disruptive daemon restart
- Extensive offline and online diagnostics such, as FCping and PathInfo (FCtracroute)
- Frame- based trunking with exchange-based routing
- Adaptive Networking services, including:
 - Per-data flow QoS
 - Ingress Port Rate Limiting
 - Traffic Isolation
 - Fabric Dynamic Profiling
 - Application "Top Talkers" report
- FC FastWrite
- FICON
- FICON cascading
- FICON CUP
- Brocade fabric services (for automatic distribution of fabric-wide policies such as port and switch binding, and so on)
- FCoE with CEE (802.1 Qaz, 802.1 Qbb, 802.1Qau, DCBX)

© 2009 Brocade Communications Systems, Inc. All Rights Reserved. 07/09 GA-TB-063-02

Brocade, the B-wing symbol, BigIron, DCX, Fabric OS, FastIron, IronPoint, IronShield, IronView, IronWare, JetCore, NetIron, SecureIron, ServerIron, StorageX, and Turbolron are registered trademarks, and DCFM and SAN Health are trademarks of Brocade Communications Systems, Inc., in the United States and/or in other countries. All other brands, products, or service names are or may be trademarks or service marks of, and are used to identify, products or services of their respective owners.

Notice: This document is for informational purposes only and does not set forth any warranty, expressed or implied, concerning any equipment, equipment feature, or service offered or to be offered by Brocade. Brocade reserves the right to make changes to this document at any time, without notice, and assumes no responsibility for its use. This informational document describes features that may not be currently available. Contact a Brocade sales office for information on feature and product availability. Export of technical data contained in this document may require an export license from the United States government.