BROCADE DCX BACKBONE FAMILY

DATA CENTER

A Platform for Evolving Data Center Fabrics

HIGHLIGHTS

- Provides a highly robust 8 Gbps platform in two modular form factors for enterprise data centers supporting open system and System z environments

- Maximizes chassis bandwidth, performance, and port density with the industry's first and only 64-port Fibre Channel blade

- Delivers over four times the performance of competitive offerings to meet data growth and access demands, expand virtualization, and consolidate resources

- Delivers five times the energy efficiency of competitive offerings, enabling data centers to support more server and storage equipment

- Provides a high-density, multiprotocol platform for consolidating server connectivity using DCB and FCoE networking technology

- Secures and protects data against threats and disasters with plug-in blades for data encryption and SAN extension

- Enables logical partitioning of platforms and fabrics into virtual data and management domains without sacrificing performance, scalability, security, or reliability

Brocade® DCX® Backbones are highly robust network switching platforms that combine breakthrough performance, scalability, and energy efficiency with long-term investment protection. Supporting open system and System z environments, Brocade DCX Backbones are designed to address the data growth and application demands of evolving enterprise data centers; enable server, SAN, and data center consolidation; and reduce infrastructure and administrative costs.

CHOICE AT THE CORE AND AT THE EDGE

Brocade DCX Backbones are available in two modular form factors. Built for large enterprise networks, the 14U Brocade DCX has eight vertical blade slots to provide up to 512 Fibre Channel ports using Brocade-branded 4 Gbps or 8 Gbps SFPs. Built for midsize networks, the 8U Brocade DCX-4S has four horizontal blade slots to provide up to 256 Fibre Channel ports.

Both models feature ultra-high-speed Inter-Chassis Link (ICL) ports to connect up to three backbones, providing extensive scalability and flexibility at the network core without using any Fibre Channel ports. At the network edge, organizations can utilize Brocade 8 Gbps switches, Brocade 48000 Directors, or—for complete backbone-class capabilities—the Brocade DCX-4S.

HIGHEST PERFORMANCE AND SCALABILITY

Both Brocade DCX models provide 256 Gbps of bandwidth per slot. When combined with unique Brocade local switching capabilities—data traffic within the same port group does not consume slot bandwidth—the Brocade DCX family provides over *four times*
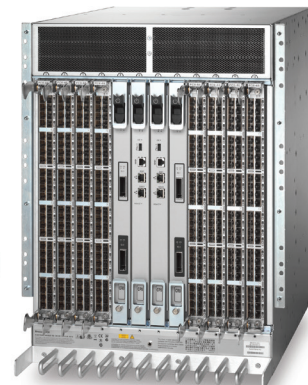
BROCADE

Figure 1. Brocade DCX Backbones provide the core platform of Brocade data center fabrics.
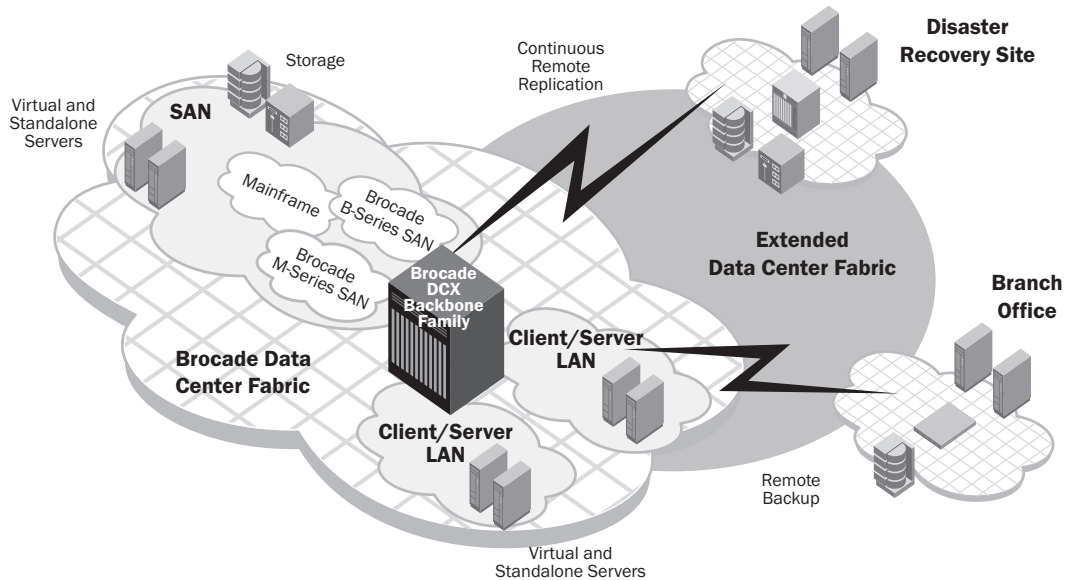
the performance of competitive offerings. Performance capabilities include:

- Brocade DCX:
  - Up to 512 ports (equivalent to 576 with ICLs) at 8 Gbps
  - 4.6 Tbps chassis bandwidth
    - 4.1 Tbps Fibre Channel/FICON® ports
    - 512 Gbps ICL bandwidth
  - 256 Gbps bandwidth per slot
- Brocade DCX-4S:
  - Up to 256 ports (equivalent to 288 with ICLs) at 8 Gbps
  - 2.3 Tbps chassis bandwidth
    - 2.0 Tbps Fibre Channel/FICON ports
    - 256 Gbps ICL bandwidth
  - 256 Gbps bandwidth per slot

FLEXIBLE, MULTIPROTOCOL ARCHITECTURE

Brocade DCX Backbones include a Virtual Fabrics feature that enables partitioning of a physical SAN into logical fabrics and isolation by application, business group, customer, or traffic type. Optional Fibre Channel Integrated Routing alleviates the need for special-purpose blades or routers to connect servers and storage in separate fabrics.

The Brocade DCX family supports 1/2/4/8 Gbps Fibre Channel and FICON, FCIP, and IPFC. To consolidate server connectivity using Data Center Bridging (DCB) and Fibre Channel over Ethernet (FCoE) in open system environments, the Brocade FCOE10-24 Blade enables a high-density, end-of-row chassis configuration.

PLUG-IN SECURITY AND DISASTER RECOVERY SOLUTIONS

The Brocade DCX family enables scalable, high-performance, and cost-effective security and disaster recovery solutions through plug-in blades. Brocade FS8-18 Encryption Blades can encrypt data-at-rest at up to 96 Gbps per blade with highly secure 256-bit AES and integrated support for leading key management applications. Brocade FX8-24 Extension Blades extend replication and backup over IP WAN links with the industry's first and only 10 Gbps FCIP connectivity.

INTELLIGENT MANAGEMENT

To help maximize network performance and reduce operational expense, Brocade Network Advisor provides intuitive system configuration, comprehensive management, and a topology-centric view across Brocade data center solutions. Brocade Network Advisor Enterprise supports both backbone models, while Brocade Network Advisor Professional (bundled) and Brocade Network Advisor Professional Plus support the Brocade DCX-4S.

SIMPLIFIED MANAGEMENT AND ROBUST NETWORK ANALYTICS

Brocade Fabric Vision technology introduces a breakthrough hardware and software solution that maximizes uptime, simplifies SAN management, and provides unprecedented visibility and insight across the storage network. Offering innovative diagnostic, monitoring, and management capabilities, Brocade DCX Backbones with Fabric Vision technology help administrators avoid problems, maximize application performance, and reduce operational costs. Brocade DCX Backbones support the following Brocade Fabric Vision technology features:

- **Flow Monitor:** Provides comprehensive visibility into flows in the fabric, including the ability to automatically learn (discover) flows and non-disruptively monitor flow performance. Users can monitor all flows from a specific host to multiple targets/LUNs or from multiple hosts to a specific target/LUN; monitor all flows across a specific ISL; or perform LUN-level monitoring of specific frame types to identify resource contention or congestion that is impacting application performance.

- **Monitoring and Alerting Policy Suite (MAPS):** Simplifies fabric-wide threshold configuration and monitoring. By leveraging pre-built rule/policy-based templates, applying thresholds and alerts to ports is a simple two-step process. Organizations can configure the entire fabric (or multiple fabrics) at one time using common rules and policies, or customize policies for specific ports—all through a single dialog. The integrated dashboard displays an overall switch health report, along with details on out-of-policy conditions, to help administrators quickly pinpoint potential issues.

- **Bottleneck Detection:** Identifies and alerts administrators to device or ISL congestion as well as abnormal levels of latency in the fabric. This feature works in conjunction with Brocade Network Advisor to automatically monitor and detect network congestion and latency in the fabric, providing visualization of bottlenecks in a connectivity map and product tree, and identifying exactly which devices and hosts are impacted by a bottlenecked port.

- **Integration into Brocade Network Advisor:** Provides customizable health and performance dashboard views to pinpoint problems faster, simplify SAN configuration and management, and reduce operational costs.

- **Critical diagnostic and monitoring capabilities:** Help ensure early problem detection and recovery.

- **Non-intrusive and non-disruptive monitoring on every port:** Provides a comprehensive end-to-end view of the entire fabric using capabilities integrated into hardware, allowing sophisticated monitoring without imposing an additional burden on switches with frequent polling activity.

BROCADE FOS—POWERED WITH TRAFFIC MONITORING AND ADAPTIVE NETWORKING

Brocade DCX Backbones utilize the powerful Brocade Fabric OS® (FOS), which provides several unique features, including Bottleneck Detection; Top Talkers (part of Advanced Performance Monitoring); and Adaptive Networking, a suite of tools that includes Ingress Rate Limiting, Traffic Isolation, and QoS. Managed through Brocade Network Advisor or the Command Line Interface (CLI), these advanced capabilities help optimize fabric behavior and application performance.

Bottleneck Detection identifies and alerts administrators to ISL or device congestion as well as device latency conditions in the fabric. Left undetected and unresolved, these conditions can cause latency and I/O timeouts, particularly in highly virtualized server environments. Top Talkers measures the top bandwidth-consuming traffic (including by individual virtual machine) in real time over a physical device connection or throughout a network switch. Ingress Rate Limiting restricts data flow from less-critical hosts at preset bandwidths. Traffic Isolation dedicates paths in the fabric to specific data flows, enabling predictability and avoiding network congestion. And QoS expedites critical traffic in the event of congestion while keeping all traffic flowing.

ENERGY EFFICIENCY AND RELIABILITY

Brocade DCX Backbones are highly efficient at reducing power consumption, cooling, and the carbon footprint in data centers. While providing unmatched performance and scale, Brocade DCX Backbones use less than one watt per Gbps—making them *five times* more efficient than competitive offerings.

To help minimize downtime costs, the Brocade DCX Backbone family builds upon years of innovation and leverages the core technology of Brocade systems performing at greater than 99.999 percent uptime in the world's most demanding data centers.

BROCADE GLOBAL SERVICES

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 15 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, and education services, enabling organizations to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

MAXIMIZING INVESTMENTS

To help optimize technology investments, Brocade and its partners offer complete solutions that include professional services, technical support, and education. For more information, contact a Brocade sales partner or visit www.brocade.com.

BROCADE DCX BACKBONE SPECIFICATIONS

Systems Architecture	
Chassis	**Single chassis:** Up to 512 (Brocade DCX) or 256 (Brocade DCX-4S) 8 Gbps (E, F, FL, M, EX) Fibre Channel ports using up to eight 16-, 32-, 48-, or 64-port Fibre Channel blades
	Dual-chassis: Up to 1024 (Brocade DCX) or 512 (Brocade DCX-4S) 8 Gbps Fibre Channel ports; ICL ports (four per chassis, copper pin) connect up to two Brocade DCX or Brocade DCX-4S chassis (same models or a mix)
	Three chassis: Up to 1536 (Brocade DCX) or 768 (Brocade DCX-4S) 8 Gbps Fibre Channel ports; ICL ports (four per chassis, copper pin) connect up to three Brocade DCX or Brocade DCX-4S chassis (same models or a mix)
Control processor	Redundant (active/standby) control processor modules
Scalability	Full-fabric architecture of 239 switches
Certified maximum	6000 active nodes; 56 switches, 19 hops in Brocade FOS fabrics; 31 switches, larger fabrics certified as required
Special-purpose blades	**Brocade FX8-24 Blade:** Provides SAN extension over IP networks (12 8 Gbps Fibre Channel ports with license options providing up to 10 1 GbE ports and up to two 10 GbE ports per blade; up to four blades)
	Brocade FS8-18 Encryption Blade: Provides plug-in encryption of data on disk or tape, supporting industry-standard AES-256 and DataFort-compatible encryption mode (16 8 Gbps Fibre Channel ports; up to four blades; requires Brocade Network Advisor management)
	Brocade FCOE10-24 Blade: Provides DCB/FCoE connectivity for server I/O consolidation (24 10 GbE DCB ports; up to two blades)
Performance	**Fibre Channel:** 1.063 Gbps line speed, full duplex; 2.125 Gbps line speed, full duplex; 4.25 Gbps line speed, full duplex; 8.50 Gbps line speed, full duplex; auto sensing of 1, 2, 4, and 8 Gbps port speeds; optionally programmable 1, 2, 4, and 8 Gbps ports
	DCB: 10.0 Gbps line speed, full duplex

ISL trunking	Frame-based trunking with up to eight 8 Gbps ports per ISL trunk; up to 64 Gbps per ISL trunk
	Exchange-based load balancing across ISLs with DPS included in Brocade Fabric OS
Chassis bandwidth	Brocade DCX: 4.6 Tbps per chassis (512 ports × 8 Gbps data rate + 512 Gbps ICL bandwidth)
	Brocade DCX-4S: 2.3 Tbps per chassis (256 ports × 8 Gbps data rate + 256 Gbps ICL bandwidth)
Slot bandwidth	256 Gbps (data rate)
Local switching bandwidth	128 Gbps for FC8-16: 16 ports × 8 Gbps (data rate)
	256 Gbps for FC8-32: 32 ports × 8 Gbps (data rate)
	384 Gbps for FC8-48: 48 ports × 8 Gbps (data rate)
	512 Gbps for FC8-64: 64 ports × 8 Gbps (data rate)
ICL bandwidth	Brocade DCX: 512 Gbps; four ICLs provide the equivalent of 64 8 Gbps ports
	Brocade DCX-4S: 256 Gbps; four ICLs provide the equivalent of 32 8 Gbps ports
	Both models: ICL bandwidth is load-balanced using eight 8-port frame-based trunks and DPS
Switch latency	Locally switched ports 700 ns; blade-to-blade latency is 2.1 µsec
Maximum frame size	2112-byte payload
Frame buffers	2048 per 16-port group on 16-, 32-, and 64-port blades and up to 2048 per 24-port group on 48-port blades, dynamically allocated
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Fibre Channel port types	FL_Port, F_Port, M_Port (Mirror Port), E_Port, EX_Port (Fibre Channel Integrated Routing); optional port type control
Data traffic types	Fabric switches supporting unicast, multicast (255 groups), and broadcast

Media types	**4 Gbps:** FC8-16, -32, and -48 blades require Brocade hot-pluggable, Small Form-Factor Pluggable (SFP), LC connector; 4 Gbps Short-Wavelength Laser (SWL); 4 Gbps Long-Wavelength Laser (LWL); 4 Gbps Extended Long-Wavelength Laser (ELWL)
	8 Gbps: FC8-16, -32, and -48; FX8-24; and FS8-18 blades require Brocade hot-pluggable SFP+, LC connector; 8 Gbps SWL; 8 Gbps LWL
	8 Gbps: FC8-64 blades require Brocade hot-pluggable mSFP, mSFP LC connector; 8 Gbps SWL only
	Fibre Channel distance subject to fiber-optic cable and port speed
	DCB media type: Hot-pluggable, Brocade 10 GbE SFP+ supports any combination of Short-Reach (SR) and Long-Reach (LR) optical transceivers; Brocade copper Twinax cables of one, three, or five meters
USB	1 USB port per control processor for firmware download, support save, and configuration upload/download
Fabric services	Advanced Performance Monitoring (including Top Talkers); Adaptive Networking (Ingress Rate Limiting, Traffic Isolation, QoS); BB credit recovery; Bottleneck Detection; Brocade Advanced Zoning (default zoning, port/WWN zoning, broadcast zoning); Dynamic Path Selection (DPS); Extended Fabrics; Fabric Watch; FDMI; Flow Monitor; Frame Redirection; FSPF; Integrated Routing; IPoFC; ISL Trunking; Management Server; Monitoring and Alerting Policy Suite (MAPS); N_Port Trunking; NPIV; NTP v3; Port Fencing; Registered State Change Notification (RSCN); Reliable Commit Service (RCS); Simple Name Server (SNS); Virtual Fabrics (Logical Switch, Logical Fabric)
Extension	Supports DWDM, CWDM, and FC-SONET devices; FCIP, data compression, Fast Write, read/write Tape Pipelining, QoS, BB credit recovery
FICON	FICON cascading (FOS: Brocade DCX, DCX-4S; and M-EOS: Brocade DCX only); support for lossless DLS with port-based and exchange-based routing; FICON CUP; Advanced Accelerator for FICON (FICON Global Mirror and XRC emulation and read/write Tape Pipelining). The FC8-64 blade does not support FICON.

High Availability	
Architecture	Passive backplane; separate and redundant control processor and core switching blades (two of each); redundant WWN cards
Chassis power	Two 2000 W AC power supply modules (100 to 240 V auto-sensing), 2N redundancy; Brocade DCX supports two additional power modules
Cooling	Brocade DCX: Three blower assembly modules (two required for operation)
	Brocade DCX-4S: Two blower assembly modules (one required for operation)
Solution availability	Designed to provide 99.999 percent uptime capabilities; hot-pluggable redundant power supplies, fans, WWN cards, processors, core switching, port blades, and optics; online diagnostics; non-disruptive firmware download and activation

Management	
Management	HTTP, SNMP v1/v3 (FE MIB, FC Management MIB), SSH; Auditing, Syslog; Brocade Advanced Web Tools, Brocade Network Advisor SAN Enterprise or Brocade Network Advisor SAN Professional Plus; Command Line Interface (CLI); SMI-S compliant; Administrative Domains; trial licenses for add-on capabilities
Security	DH-CHAP (between switches and end devices), FIPS 140-2 L2-compliant, HTTPS, IPsec, IP filtering, LDAP, OpenLDAP, Port Binding, RADIUS, Role-Based Access Control (RBAC), Secure Copy (SCP), Secure RPC, SSH v2, SSL, Switch Binding, TACACS+, Trusted Switch
Management access	10/100/1000 Ethernet (RJ-45) per control processor, in-band over Fibre Channel; serial port (RJ-45) and one USB per control processor module; call-home integration enabled through Brocade Network Advisor
Diagnostics	POST and embedded online/offline diagnostics, including RAStrace logging, environmental monitoring, non-disruptive daemon restart, FCping and Pathinfo (FC traceroute), port mirroring (SPAN port), and Rolling Reboot Detection (RRD)

Mechanical Specifications

Enclosure	Rear panel-to-door airflow; Brocade DCX-4S ships with 1U exhaust shelf
Mounting	Rack-mountable in a standard 19-inch EIA cabinet
Size	Brocade DCX Width: 43.74 cm (17.22 in.) Height: 61.24 cm (24.11 in., 14U) Depth (without door): 61.19 cm (24.09 in.) Depth (with door): 73.20 cm (28.82 in.) Brocade DCX-4S Width: 43.74 cm (17.22 in.) Height: 35.00 cm (13.78 in., 8U) plus 4.37 cm exhaust shelf (1.72 in., 1U) Depth without door: 61.19 cm (24.09 in.) Depth with door: 73.20 cm (28.82 in.)
System weight	Brocade DCX 103.50 kg (228.20 lb) for 512-port configuration fully populated; 39.55 kg (82.20 lb) for chassis Brocade DCX-4S 68.04 kg (150.00 lb) for 256-port configuration fully populated; 25.76 kg (56.80 lb) for chassis

Environment

Temperature	Operating: 0°C to 40°C (32°F to 104°F) Non-operating: –25°C to 70°C (–13°F to 158°F)
Humidity	Operating: 20% to 85% RH non-condensing at 40°C (104°F) Non-operating and storage (non-condensing): 10% to 93% at 70°C (158°F)
Altitude	Up to 3000 meters (9842 feet)
Shock	Operating: 20 g, 6 ms, half sine Non-operating: 33 g, 11 ms, half sine
Vibration	Operating: 0.5 g p-p, 5 to 500 Hz Non-operating: 2.0 g p-p, 5 to 500 Hz
Heat dissipation	Brocade DCX Min: 16-port configuration of 504 W, 1720 BTU/hr Max: 512-port configuration of 1528 W, 5216 BTU/hr Brocade DCX-4S Min: 16-port configuration of 383 W, 1306 BTU/hr Max: 256-port configuration of 862 W, 2943 BTU/hr
CO_2 emissions	Brocade DCX — 5.6 metric tonnes per year (with 512 ports at 0.42 kg/kWh) 1.4 kg per Gbps per year Brocade DCX-4S — 3.2 metric tonnes per year (with 256 ports at 0.42 kg/kWh) 1.5 kg per Gbps per year

Power

Supported power range	Voltage	Range: 85 to 264 VAC Auto-volt Nominal: 100 to 240 VAC
	Power	85 to 132 VAC: 1000 W 180 to 264 VAC: 2000 W
In-rush current	20 Amps maximum, peak	
Frequency	47 to 63 Hz	

For information about supported SAN standards, visit www.brocade.com/sanstandards.

For information about switch and device interoperability, visit www.brocade.com/interoperability.

For information about hardware regulatory compliance, visit www.brocade.com/regulatorycompliance.

Corporate Headquarters
San Jose, CA USA
T: +1-408-333-8000
info@brocade.com

European Headquarters
Geneva, Switzerland
T: +41-22-799-56-40
emea-info@brocade.com

Asia Pacific Headquarters
Singapore
T: +65-6538-4700
apac-info@brocade.com

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