BROCADE 48000 DIRECTOR

STORAGE AREA NETWORK

A Powerful Director for Enterprise SAN Solutions

HIGHLIGHTS

- Delivers industry-leading 4 and 8 Gbit/sec Fibre Channel connectivity for high-performance SANs
- Provides up to 384 ports in a single domain and a 14U enclosure with up to 1152 ports in a single rack, enabling SAN fabrics with thousands of ports
- Offers 10 Gbit/sec blades for Inter-Switch Links (ISLs) over dark fiber or DWDM
- Meets ultra-high-availability requirements with redundant, hot-pluggable components, no single points of failure, and non-disruptive software upgrades
- Improves efficiency for significant operational savings on power, cooling, and data center resources
- Provides native interoperability with Brocade M-Enterprise OS (M-EOS) fabrics
- Offers Fibre Channel routing, hardware-assisted traffic forwarding for Fibre Channel over IP (FCIP), and iSCSI connectivity
- Supports FICON, FICON cascading, and FICON CUP support for IBM System z environments; supports intermix of FCP and FICON on a port-by-port basis

The Brocade® 48000 Director delivers industry-leading 4, 8, and 10 Gbit/sec Fibre Channel performance, high availability, multiprotocol connectivity, and broad investment protection for enterprise SANs. It scales non-disruptively from 32 to as many as 384 concurrently active 4 or 8 Gbit/sec full-duplex ports in a single domain. In addition, it supports blades for Fibre Channel Routing, FCIP, and iSCSI, and is designed to support a wide range of fabric-based applications. The Brocade 48000 also provides industry-leading power and cooling efficiency, helping to reduce the total cost of ownership.

With its intelligent fifth-generation ASIC, the Brocade 48000 is a reliable foundation for core-to-edge SANs (including native operation with Brocade M-EOS fabrics), enabling fabrics capable of supporting thousands of hosts and storage devices (see Figure 1). Whether used as a core building block for an enterprise fabric or as a standalone director, the Brocade 48000 is designed to be a reliable, high-availability solution.

The Brocade 48000 can integrate with heterogeneous environments that include IBM mainframes and open systems platforms with multiple operating systems such as Microsoft Windows, Linux, Solaris, HP-UX, AIX, and i5/OS. These capabilities help make it ideal for enterprise management and high-volume transaction processing applications such as ERP and data warehousing, as well as data backup, remote mirroring, and high-availability clustering.

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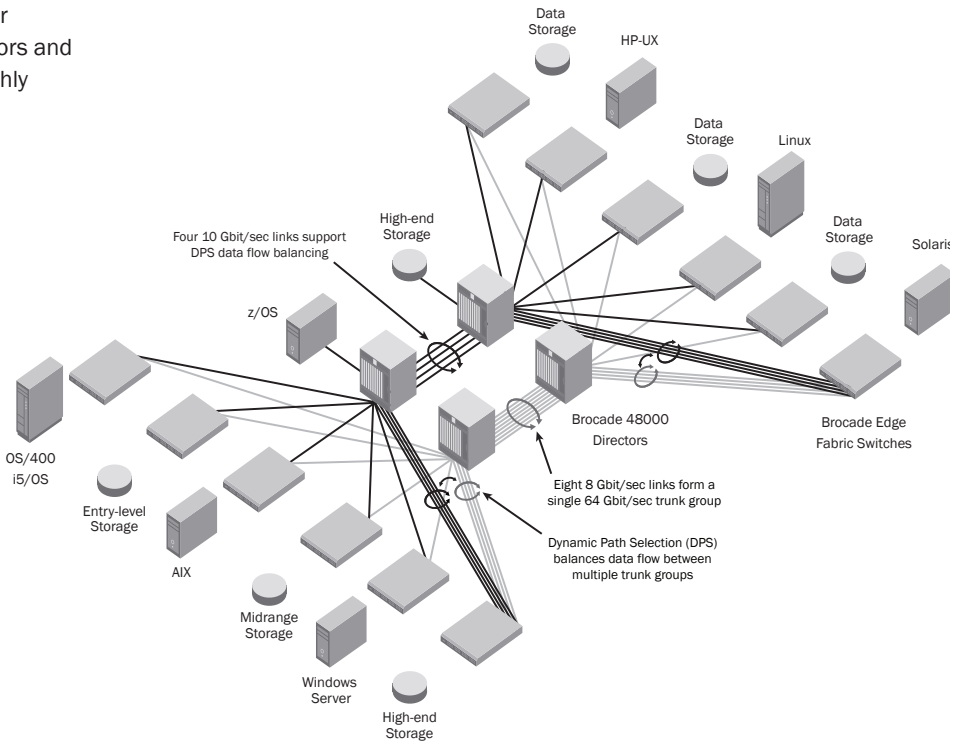
BROCADE

Figure 1. A Brocade 48000 Director surrounded by Brocade edge directors and switches enables cost-effective, highly scalable enterprise SANs.



ULTRA-HIGH AVAILABILITY THROUGHOUT THE FABRIC

The core-to-edge SAN model features redundancy within the director as well as a high-availability network approach for the entire fabric. The ultra-high-availability features of Brocade Fabric OS® help deliver continuous overall system availability with:

- Non-disruptive software upgrades and hot code activation
- Dual-redundant control processors with stateful failover
- Redundant, hot-swappable components and redundant power and cooling subsystems

INDUSTRY-LEADING PERFORMANCE

The Brocade 48000 delivers industry-leading performance while using the least data center resources of any SAN director, resulting in significant electricity savings and cooling efficiency. It is ideal for large SANs that require the highest levels of performance, with each blade slot delivering 64 Gbit/sec of bandwidth to front-facing ports. Moreover, local switching enables neighboring director ports to communicate without having to use valuable backplane bandwidth—resulting in lower switching latency and full-speed 8 Gbit/sec port density.

To provide even higher performance, enhanced Brocade ISL Trunking combines up to eight 8 Gbit/sec ports between switches into a single, logical high-speed trunk running at up to 64 Gbit/sec. In addition, exchange-based Dynamic Path Selection (DPS) optimizes fabric-wide performance and load balancing by automatically routing data to the most efficient available path in the fabric.

To enhance business continuity across metro distances, the Brocade 48000 can utilize 8 Gbit/sec blades or 10 Gbit/sec blades (using dark fiber or DWDM) between sites. In this scenario, exchange-based DPS provides automatic load balancing and routing to optimize performance.

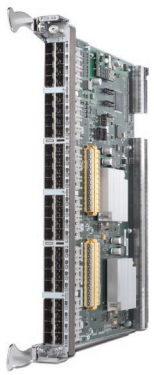


Figure 2. 8 Gbit/sec blades for the Brocade 48000 Director are available in 16-, 32-, and 48-port configurations.

INTELLIGENT SAN MANAGEMENT AND MONITORING

To centralize SAN management for greater efficiency, the Brocade 48000 leverages Fabric OS, the embedded operating system that provides native interoperability with Brocade M-EOS fabrics. Organizations can also utilize a command line interface, the Brocade Web Tools utility, and Brocade Advanced Performance Monitoring to improve resource optimization and productivity. Moreover, Brocade utilities integrate with popular third-party storage management applications.

FICON SUPPORT FOR IBM MAINFRAME ENVIRONMENTS

The Brocade 48000 supports the FICON protocol for IBM mainframe environments with 4 and 8 Gbit/sec blades—enabling Fibre Channel and FICON traffic on a port-by-port basis in intermix mode. In addition, the Brocade FICON implementation supports cascaded FICON technologies; 1, 2, 4, and 8 Gbit/sec FICON speeds; the Brocade FR4-18i blade cascading over IP connections; and CUP in-band management. With N_Port ID Virtualization (NPIV) technology, the Brocade 48000 also enables the sharing of a single FCP port connected to an FCP channel across multiple operating system images.

INTELLIGENT FABRIC APPLICATIONS

The Brocade 48000 supports the next-generation Brocade FA4-18 blade for a variety of fabric-based applications—increasing flexibility, improving operational efficiency, and simplifying SAN management. This includes Brocade OEM and ISV Partner applications for storage virtualization/volume management, replication, and data mobility, as well as Brocade Data Migration Manager.

INVESTMENT PROTECTION

To help protect and leverage existing technology investments, the Brocade 48000 provides backward and forward compatibility with all Brocade switch offerings. Organizations can also natively connect the Brocade 48000 to Brocade M-EOS switch and director environments to expand and leverage M-EOS fabrics.

PERFORMANCE-OPTIMIZED SAN EXTENSION

The Brocade 48000 can utilize the Brocade FR4-18i blade to interconnect SAN islands for greater resource utilization and long-distance extension—without the associated risk and complexity of physically merging SAN islands. Unique bandwidth-maximizing features for Fibre Channel-over-IP (FCIP) include:

- Hardware-based compression, IPSec encryption, eight virtual FCIP tunnels per port, traffic-shaping, and QoS capabilities
- Fast Write for FCIP and Fibre Channel extension capabilities, and Tape Pipelining for maximizing performance over high latencies
- Extensive port buffering and line-rate Gigabit Ethernet performance with support for jumbo packets
- Extended WAN analysis tools for bandwidth, latency, and packet loss

The Brocade 48000 also supports the Brocade FC4-16IP iSCSI blade, which enables cost-effective, easy-to-manage Ethernet connectivity so low-cost servers can access high-performance Fibre Channel storage resources.

MAXIMIZING SAN INVESTMENTS

Brocade and its partners offer complete SAN solutions to meet a wide range of technology and business requirements. These solutions include education and training, support, service, and professional services to help optimize SAN investments. For more information, contact an authorized Brocade sales partner or visit www.brocade.com.

BROCADE 48000 DIRECTOR SPECIFICATIONS

Systems Architecture	
System blades	Up to 384 4 or 8 Gbit/sec Fibre Channel ports; up to eight Fibre Channel blades (16, 32, or 48 ports per blade); up to 1152 ports per 42U rack Up to eight Brocade FC10-6 blades (six 10 Gbit/sec Fibre Channel ports per blade) Up to two Brocade FR4-18i blades (16 4 Gbit/sec Fibre Channel ports and two Gigabit Ethernet ports per blade) Up to four Brocade FC4-16IP iSCSI blades (eight 4 Gbit/sec Fibre Channel ports and eight Gigabit Ethernet ports per blade) Up to two Brocade FA4-18 Application Blades (16 4 Gbit/sec Fibre Channel ports and two Gigabit Ethernet ports per blade)
Control processor	Redundant (active/standby) control processor modules
Scalability	Full fabric architecture of 239 switches maximum
Certified maximum	Combination of 56 switches, 19 hops; larger fabrics certified as required; consult Brocade or OEM SAN design documents for configuration details
Port rates	1.063 Gbit/sec line speed, full duplex; 2.125 Gbit/sec line speed, full duplex; 4.25 Gbit/sec line speed, full duplex; auto-sensing of 1, 2, and 4 Gbit/sec port speeds; optionally programmable to fixed port speed; speed-matching between 1, 2, and 4 Gbit/sec ports and between 2, 4, and 8 Gbit/sec ports; 10.5 Gbit/sec line speed, full duplex, fixed port speed
ISL Trunking	Up to eight ports per ISL trunk, delivering up to 64 Gbit/sec per ISL trunk using 8 Gbit/sec ports. Trunking is not supported with the FC10-6 (10 Gbit/sec) blade.
Aggregate bandwidth	1024 Gbit/sec backplane switching capacity 3.264 Tbit/sec (4 Gbit/sec blades, local switching) 6.528 Tbit/sec (8 Gbit/sec blades, local switching)
Switch latency	<2.1 µsec any port to any port at 2 Gbit/sec, cut-through routing; <3.6 µsec any port to any port at 4 Gbit/sec, cut-through routing; <7.4 µsec any port to any port at 10 Gbit/sec, cut-through routing
Maximum frame size	2112-byte payload
Frame buffers	1000 for FC4-16, FR4-18i, FC4-16IP; 2000 for FC4-32, FC4-48; dynamically allocated up to 255 per port; 2000 for FC8-16, FC8-32, and FC8-48 with up to 1500 per port; 720 for FC10-6
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	FL_Port (all except on FC4-48 and FC10-6 blades), F_Port, E_Port, self-discovery based on switch type (U_Port); port type control for EX_Port, VE_Port and Vex_Port; Gigabit Ethernet for VE_Port and Vex_Port; FC10-6 supports E_Port only
Data traffic types	Fabric switches supporting unicast, multicast (255 groups), and broadcast
Media types	Hot-pluggable, industry-standard Small Form-factor Pluggable (SFP), LC connector; Short-Wavelength Laser (SWL) up to 500 meters (1640 feet); Long-Wavelength Laser (LWL) up to 10 km (6.2 mi); FC10-6 blade also supports Extended Long-Wavelength Laser (ELWL) up to 80 km (49.6 mi); distance depends on fiber-optic cable and port speed, CWDM SFPs (8 lambdas)
Fabric services	Simple Name Server; Registered State Change Notification (RSCN); Alias Server (multicast); Brocade Advanced Zoning, FICON Control Unit Port (CUP) on FC4 and FC8 (16- and 32-port) blades, Web Tools, Fabric Watch, Extended Fabrics, Remote Switch, ISL Trunking, and Advanced Performance Monitoring

BROCADE 48000 DIRECTOR SPECIFICATIONS (CONTINUED)

High Availability	
Chassis power	Two AC-DC power supply modules, each delivering 1000 W DC, 2N redundancy; with Brocade FA4-18, FR4-18i, FC10-6, and FC4-16IP blades four AC-DC power supply modules are required for full redundancy
Cooling	Three blower assembly modules (two operational required)
Solution availability	Designed to provide 99.999% uptime capabilities to meet the highest availability standards Hot-pluggable redundant power supplies, fans, processors, port blades, and optics; online diagnostics; non-disruptive firmware download and activation

Management	
Management software supported	Telnet; RADIUS; SNMP (FE MIB, FC Management MIB); Web Tools; Fabric Watch; third-party applications utilizing the Brocade SMI Agent
Management access	10/100 Ethernet (RJ-45), in-band over Fibre Channel (requires fabric); two serial ports (DB-9) per control processor module

Mechanical Specifications	
Enclosure	Rear panel-to-door airflow
Width	43.74 cm (17.22 in)
Height	61.24 cm (24.11 in) for 14U
Depth	70.90 cm (27.90 in) without door 74.20 cm (29.20 in) with door
System weight	95 kg (210 lb) for 128-port configuration (eight 16-port blades, without media) 98 kg (216 lb) for: • 256-port configuration (eight 32-port blades, without media) • 384-port configuration (eight 48-port blades, without media) • 48-port configuration (eight 6-port blades, without media)

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: 5% to 85% non-condensing at 40° C (104° F) Non-operating and storage (non-condensing): 0% to 93%
Altitude	Up to 3000 meters (9800 feet)
Shock	Operating: 20G, 11 ms, half sine 1G p-p, 5–500Hz, 1 octave min Non-operating: 33G, 11 ms, half sine 2.4G p-p, 5–500Hz, 1 octave min
Vibration	Operating: 5G p-p, 0 to 3 kHz at 1.0 octave min Non-operating: 10G p-p, 0 to 5 kHz at 1.0 octave min
Heat dissipation	710 W or 2425 BTU (525 W DC internal draw) to 1681 W or 5832 BTU (1261 W DC internal draw), subject to blade type
CO_2 emissions	4,990 kg per year

Power	
Supported power range	Nominal: 200 to 240 VAC nominal, 5.0 A, single phase Operating: 180 to 264 VAC auto-sensing Note: 256-port configuration requires a maximum of 750 Volt-Amps
In-rush current	40 Amps maximum, peak
Frequency	47 to 63 Hz

Regulatory Compliance

Country/Region	Safety	EMI/EMC
Canada	CSA 60950	ICES 003 Class A
United States	UL 60950	FCC Part 15 Class A
Japan	IEC60950	VCCI Class A ITE
European Community	EN60950 TUV, NEMKO	EN55022 Level A EN55024
Korea	—	RRL
Russia	GOST	GOST
Australia/New Zealand	—	AS/NZS 3548 Class A
International	IEC 60950	CISPR 22 Class A

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

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

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