BROCADE 48000 DIRECTOR

STORAGE AREA NETWORK

A Powerful Director for Enterprise SAN Solutions

HIGHLIGHTS

- Provides industry-leading 4 Gbit/sec Fibre Channel port speeds and features to improve enterprise storage solutions
- Improves efficiency for significant operational savings on power, cooling, and data center resources
- Delivers up to 384 ports in a single domain and a 14U enclosure with up to 1152 ports in a single rack, facilitating SAN fabrics with thousands of ports
- Meets ultra-high-availability requirements with redundant, hot-pluggable components, no single points of failure, and non-disruptive software upgrades
- Provides FICON® support for IBM mainframe environments, including intermix mode on a port-by-port basis; cascaded FICON fabrics; 1, 2, and 4 Gbit/sec FICON speeds; N_Port Virtualization (NPIV) supporting multiple Logical Partitions (LPARs) on servers; and CUP support
- Increases SAN performance with local switching and enhanced Brocade Inter-Switch Link (ISL) Trunking
- Offers industry-first 4 Gbit/sec Fibre Channel routing, hardware-assisted traffic forwarding for Fibre Channel over IP (FCIP), and iSCSI connectivity

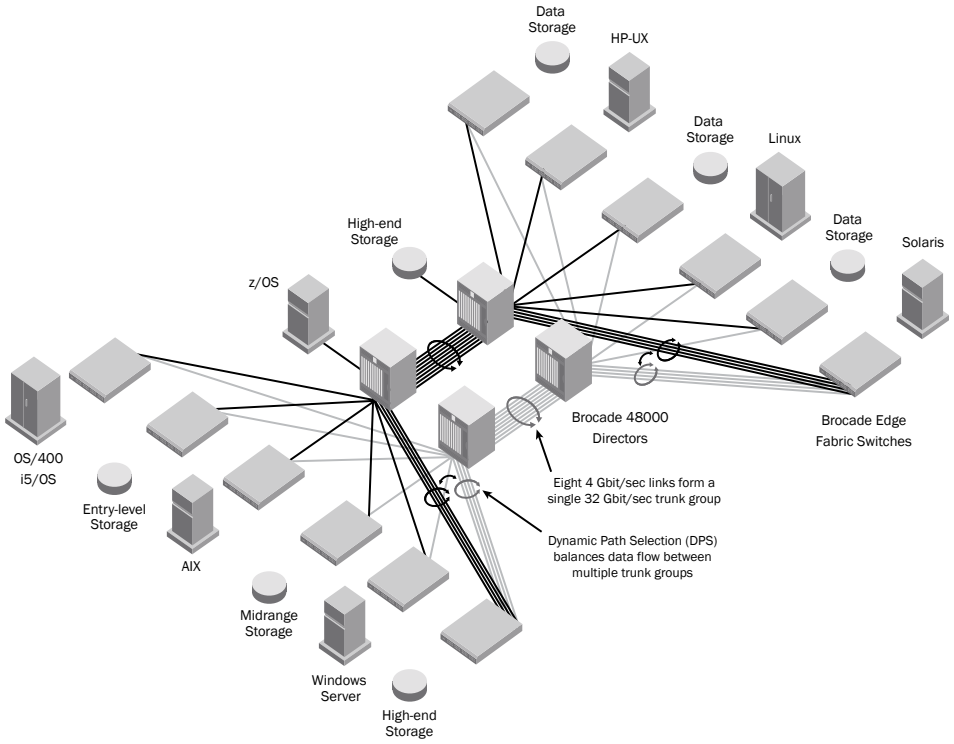
With state-of-the-art performance and enhanced scalability for open system and IBM mainframe enterprise SAN environments, the Brocade® 48000 Director provides unique capabilities to meet the full spectrum of mission-critical requirements. It scales non-disruptively from 32 to as many as 384 concurrently active 4 Gbit/sec full-duplex ports in a single domain. In addition, it supports Fibre Channel routing, FCIP, and iSCSI, and is designed for future applications and higher-speed options. 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, 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 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.

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
- Power-On Self-Test (POST), online/offline diagnostics, and per-port statistics
- Error detection, fault isolation, and remote notification of system events

INDUSTRY-LEADING PERFORMANCE

The Brocade 48000 is ideal for large SANs that require the highest levels of performance, with each line card slot making 64 Gbit/sec of bandwidth available 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 higher full-speed 4 Gbit/sec port density.

To provide even higher performance, enhanced Brocade ISL Trunking combines up to eight 4 Gbit/sec ports between switches into a single, logical high-speed trunk running at up to 32 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.

The Brocade 48000 delivers this industry-leading performance while using the least data center resources of any 4 Gbit/sec SAN director, resulting in significant electricity savings and cooling efficiency.

INTELLIGENT SAN MANAGEMENT AND MONITORING

The Brocade 48000 leverages Fabric OS, the embedded operating system, to centralize SAN management for greater efficiency. Organizations can utilize a command line interface for automated scripting or the GUI-based Brocade Web Tools utility. Organizations can also use Brocade Advanced Performance Monitoring and auditing capabilities to improve resource optimization and administrator productivity. Moreover, Brocade utilities integrate with popular third-party storage management applications. To simplify analysis, port mirroring provides the ability to mirror SID/DID traffic to a Fibre Channel analyzer.

FICON SUPPORT FOR IBM MAINFRAME ENVIRONMENTS

The Brocade 48000 supports the FICON protocol for IBM mainframe environments on FC4-16 and FC4-32 blades, enabling organizations to run both open systems Fibre Channel and FICON traffic on a port-by-port basis in intermix mode. In addition, switch- and port-binding ACL support enables cascaded FICON topologies. The Brocade FICON implementation supports 1, 2, and 4 Gbit/sec FICON speeds—along with the CUP in-band management protocol for use with SA/390, DCM, or RMF monitoring platforms. With N_Port Virtualization (NPIV) technology, the Brocade 48000 enables the sharing of a single FCP port connected to an FCP channel across multiple operating system images.

UPGRADE PATHS FOR INVESTMENT PROTECTION

To help protect existing technology investments, the Brocade 48000 provides backward and forward compatibility with Brocade entry, midrange, and director offerings. Options for Fibre Channel routing, FCIP, and iSCSI are available, and the Brocade 48000 is designed for future applications and higher-speed options. The Brocade 48000 also enables organizations to reuse Brocade 24000 port blades in certain configurations.

PERFORMANCE-OPTIMIZED SAN EXTENSION

The Brocade 48000 can utilize the Brocade FR4-18i blade module 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 and IPSec encryption
- Extensive port buffering and line-rate Gigabit Ethernet performance with support for jumbo packets
- Scalable fan-in of multiple distant SANs
- Fast Write for FCIP capabilities and Tape Pipelining for maximizing performance over high latencies
- Extended WAN analysis tools for bandwidth, latency, and packet loss
- Eight virtual FCIP tunnels per port, each with its own unique traffic-shaping and QoS capabilities, for maximum scalability and utilization of WAN resources

The Brocade 48000 also supports the Brocade FC4-16IP iSCSI blade module, 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	
Fibre Channel ports	Up to 384 4 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 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)
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
Performance	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
ISL Trunking	Up to eight 4.25 Gbit/sec ports per ISL trunk; up to 32 Gbit/sec per ISL trunk. Up to two 8-port trunk groups supported on FC4-16 blades, four 8-port trunk groups supported on FC4-32 blades, and eight 8-port trunk groups supported on FC4-48 blades. ISL Trunking at 2 Gbit/sec for compatibility with Brocade 3000 series switches and Brocade 12000 and 24000 directors.
Aggregate bandwidth	3.264 Tbit/sec
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
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
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	FL_Port (all except on FC4-48 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.
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); 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 FC4-16 and FC4-32 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 FR4-18i and FC4-16IP blades, four AC-DC power supply modules are required for full redundancy
Cooling	Three blower assembly modules (two operational required)

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 FC4-16 blades, without media) 98 kg (216 lb) for 256-port configuration (eight FC4-32 blades, without media) 98 kg (216 lb) for 384-port configuration (eight FC4-48 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	1160 W AC or 3949 BTU (845 W DC internal draw) (eight FC4-48 blades and two CP4 blades) 915 W AC or 3115 BTU (645 W DC internal draw) (eight FC4-32 blades and two CP4 blades) 710 W AC or 2425 BTU (525 W DC internal draw) (eight FC4-16 blades and two CP4 blades)
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

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

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

Corporate Headquarters
San Jose, CA USA
T: (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

BROCADE