



The 4 Gbit/sec Brocade SilkWorm 48000 Director provides the state-of-the-art in reliability, performance, and intelligence for Storage Area Networks (SANs) in mission-critical enterprise environments.

SILKWORM 48000 DIRECTOR

Highlights

- Provides industry-leading 4 Gbit/sec Fibre Channel port speeds and new technology features
- Delivers up to 256 ports in a single domain and a 14U enclosure with up to 768 ports in a single rack, facilitating more easily managed 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 zSeries server environments, including intermix mode on a port-by-port basis, cascaded FICON fabrics, 1 and 2 Gbit/sec FICON speeds, and CUP support
- Increases performance through reduced latency and enhanced Brocade Inter-Switch Link (ISL) Trunking
- Leverages intelligent Brocade SAN management and security tools to increase operational efficiency and maximize SAN investments
- Protects investments by enabling upgrade paths to future technologies, increased port speeds, IP connectivity, and more

A 4 Gbit/sec High-Port-Density, Multiprotocol Director for Enterprise SANs

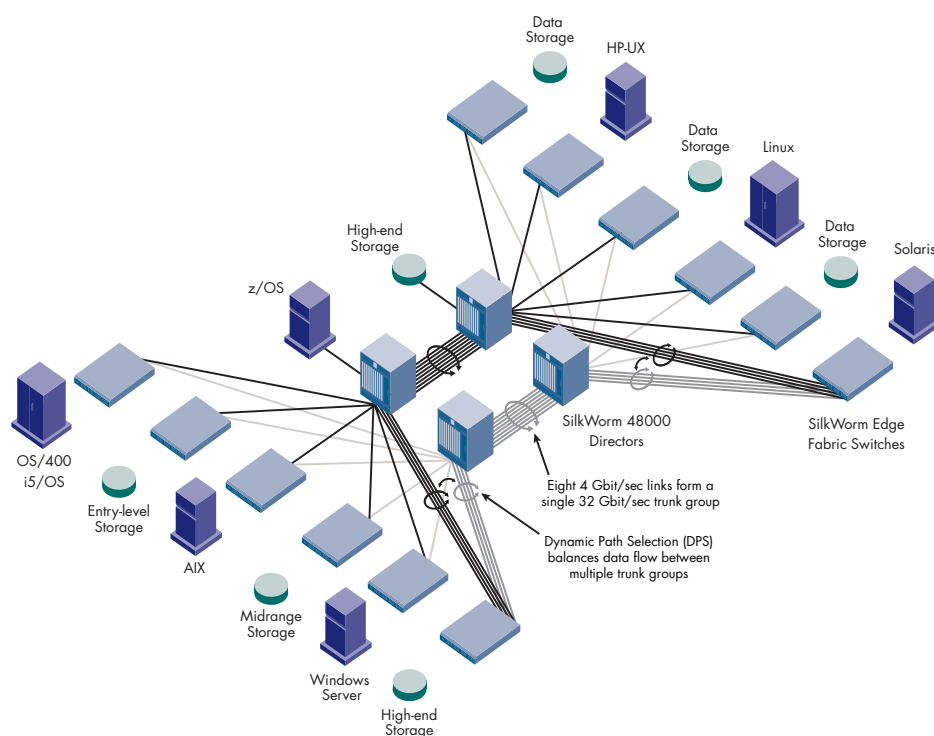
With state-of-the-art performance and enhanced scalability for both open system and IBM zSeries server enterprise SAN environments, the Brocade® SilkWorm® 48000 Director provides unique capabilities to meet the full spectrum of mission-critical requirements. It scales non-disruptively from 32 to as many as 256 concurrently active 4 Gbit/sec full-duplex ports in a single domain. In addition, it offers improved performance and the potential to upgrade to higher-speed connectivity in the future. The SilkWorm 48000 also provides industry-leading power and cooling efficiency, helping to reduce total cost of ownership.

With its intelligent fifth-generation ASIC and new capabilities, the SilkWorm 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 SilkWorm 48000 is designed for a reliable, high-availability solution. These capabilities 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.

The SilkWorm 48000 is designed to integrate with heterogeneous environments that include IBM zSeries server and open platforms with multiple operating systems such as Microsoft Windows, Linux, Solaris, HP-UX, AIX, and i5/OS. As a result, Brocade-based SANs can help serve as the foundation for implementing utility computing and Information Lifecycle Management (ILM).

Figure 1. A SilkWorm 48000 director surrounded by SilkWorm 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 provide a SAN infrastructure capable of delivering continuous overall system availability with features that include:

- 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
- Continuous monitoring of environmental components
- Power-On Self-Test (POST), online/offline diagnostics, and per-port statistics
- Error detection and fault isolation facilities
- Call-home capabilities to provide remote notification of system events

A NEW LEVEL OF SAN SECURITY

To help protect valuable information, the SilkWorm 48000 supports Brocade Secure Fabric OS®, the most comprehensive

fabric-based security platform available. Based on the latest networking security technology, Secure Fabric OS addresses a wide variety of vulnerabilities within the SAN fabric and helps prevent downtime due to human error.

INDUSTRY-LEADING PERFORMANCE

With its high-performance architecture, the SilkWorm 48000 is ideal for use in the core of large SANs that require the highest levels of performance. Scaling up to 256 ports, the SilkWorm 48000 combines high speeds and high density at the edge—enabling organizations to build the best infrastructure for specific applications. To provide even higher performance, enhanced Brocade ISL Trunking combines up to eight 4 Gbit/sec ports between a pair of 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. DPS augments ISL Trunking to provide more effective load balancing in certain configurations, such as routing data between multiple trunk groups for higher availability.

To support disaster recovery and business continuance operations, the SilkWorm 48000 extends distances between servers and storage devices. Support for distances up to 500 kilometers at 1 Gbit/sec and 100 kilometers at 4 Gbit/sec at full bandwidth facilitates high-performance, long-distance SAN solutions for data replication and business continuance. Large enterprises can also leverage ISL Trunking over distance to increase throughput, achieving 6 Gbit/sec up to 250 kilometers by using a 3-port by 2 Gbit/sec trunk.

INTELLIGENT SAN MANAGEMENT AND MONITORING

The SilkWorm 48000 leverages Fabric OS, the embedded operating system, to centralize SAN management for greater efficiency. This approach enables heterogeneous device connectivity, automatic data routing, self-healing capabilities, and scalable connectivity options. To simplify daily SAN management, 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 to improve SAN performance tuning, resource optimization, and administrator productivity. Moreover, the Brocade Fabric Access API integrates with popular third-party storage management applications, enabling organizations to continue using their storage management tools of choice.

FICON SUPPORT FOR IBM ZSERIES ENVIRONMENTS

The SilkWorm 48000 supports the FICON protocol for IBM zSeries server environments, enabling organizations to run both open systems Fibre Channel and FICON traffic on a port-by-port basis in intermix mode within a single director. The Brocade FICON implementation also supports cascaded FICON fabrics and both 1 and 2 Gbit/sec FICON speeds, as well as the CUP in-band management protocol for use with SA/390, DCM, or RMF monitoring platforms.

UPGRADE PATHS FOR INVESTMENT PROTECTION

To help protect existing technology investments, the SilkWorm 48000

provides backward and forward compatibility with SilkWorm entry, midrange, and director offerings. The SilkWorm 48000 also enables organizations to leverage their investments in the SilkWorm 24000 by reusing SilkWorm 24000 port blades in supported SilkWorm 48000 configurations. (For specific SilkWorm 24000 upgrade options, contact an authorized Brocade Partner or visit www.brocade.com.)

In addition, the SilkWorm 48000 is designed to integrate future blades that support inter-fabric routing and IP protocols. These capabilities help “future-proof” the SilkWorm 48000 for years to come.

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.

SILKWORM 48000 DIRECTOR SPECIFICATIONS

Systems Architecture

Fibre Channel ports	Up to 256 ports, universal (E, F, and FI); up to eight Fibre Channel modules, either 16 or 32 ports; up to 768 ports per 42U rack
Control processor	Redundant (active/standby) control processor modules
Scalability	Full fabric architecture 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
Interoperability	Any SilkWorm 2000 family switch, SilkWorm 3000 family switch, SilkWorm 4000 family switch, SilkWorm 200E, SilkWorm 12000, and SilkWorm 24000
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 and four 8-port trunk groups supported on FC4-32. ISL Trunking at 2 Gbit/sec for compatibility with SilkWorm 3000 series switches and SilkWorm 12000 and 24000 directors
Aggregate bandwidth	2.176 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	1024 per blade, dynamically allocated up to 255 per port
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	FL_Port, F_Port, and E_Port; self-discovery based on switch type (U_Port); optional port type control
Data traffic types	Fabric switches supporting unicast, multicast (255 groups), and broadcast

SILKWORM 48000 DIRECTOR

SILKWORM 48000 DIRECTOR SPECIFICATIONS (CONTINUED)

Systems Architecture (continued)

Media types Hot-pluggable, industry-standard Small Form-factor Pluggable (SFP), LC connector; Short-Wavelength Laser (SWL) up to 500 meters (1,640 feet); Long-Wavelength Laser (LWL) up to 10 km (6.2 mi); Extended Long-Wavelength Laser (ELWL) up to 100 km (62.1 mi); distance depends on fiber optic cable and port speed
Note: For 4 Gbit/sec operations, only SWL is supported.

Fabric services Simple Name Server; Registered State Change Notification (RSCN); Alias Server (multicast); Brocade Advanced Zoning, FICON Control Unit Port (CUP), Web Tools, Fabric Watch, Extended Fabrics, Remote Switch, ISL Trunking, and Advanced Performance Monitoring

High Availability

Chassis power Two AC-DC power supply modules, 2N 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 Brocade Fabric Access API and/or SMI-S

Management access 10/100 Ethernet (RJ-45), in-band over Fibre Channel (requires fabric); two serial ports (DB-9) per control processor module

Diagnostics POST and embedded online/offline diagnostics

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 (8 x FC4-16, without media)
98 kg (216 lb) for 256-port configuration (8 x FC4-32, without media)

Environment

Temperature Operating: 0° C to 40° C (50° 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 3kHz at 1.0 octave min
Non-operating: 10G p-p, 0 to 5 kHz at 1.0 octave min

Heat dissipation 915 W or 3115 BTU (eight FC4-32 blades and two CP4 blades)
710 W or 2425 BTU (eight FC4-16 blades and two CP4 blades)

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



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