The Brocade SilkWorm 24000 Director provides a highly reliable and intelligent solution for deploying enterprise-class Storage Area Networks (SANs) in mission-critical environments.

SILKWORM 24000 DIRECTOR

Highlights

- Delivers up to 128 ports in a single domain in a 14U enclosure with up to 384 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, non-disruptive software upgrades, and hot code activation

- Enables a new level of SAN security with Brocade Secure Fabric OS®, a comprehensive security platform for the entire SAN fabric

- Increases performance locally and in the network with reduced latency (less than 2.1 microseconds) and with Brocade Inter-Switch Link (ISL) Trunking, which enables a high-speed data path of up to 8 Gbit/sec

- Leverages intelligent Brocade SAN management and monitoring tools to increase operational efficiency and maximize SAN investments

- Provides FICON® support for mainframe environments, including intermix mode in support of open systems and FICON, cascaded FICON fabrics, 1 and 2 Gbit/sec FICON speeds, and planned CUP support for popular mainframe monitoring tools

- Protects investments by enabling seamless upgrades to future technologies such as 4 and 10 Gbit/sec Fibre Channel, iSCSI, FCIP, and others

A High-Port-Density, Multiprotocol Director for Enterprise SANs

With state-of-the-art performance and enhanced scalability for both open system and mainframe enterprise SAN environments, the Brocade® SilkWorm® 24000 Director provides unique capabilities to meet a variety of mission-critical requirements. By supporting 128 concurrently active 2 Gbit/sec full-duplex ports in a single domain, the SilkWorm 24000 enables non-disruptive scalability from 32 to 128 ports. In addition, it offers improved performance and reduced latency, reduced management costs through a higher port/domain ratio, lower total cost of ownership through more effective power usage, and the ability to upgrade to higher-speed connectivity in the future.

With its intelligent fourth-generation ASIC, the SilkWorm 24000 provides 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 24000 is ideal for medium- to large-sized organizations that need a high-availability solution designed for ever-changing business requirements. These capabilities make it ideal for key applications such as data backup, remote mirroring, and high-availability clustering as well as high-volume transaction processing applications such as ERP and data warehousing.

The SilkWorm 24000 is designed to integrate with heterogeneous environments that include mainframe and open platforms with multiple operating systems such as Windows NT, Windows XP, UNIX, Linux, Solaris, AIX, and Z/OS. As a result, organizations have the flexibility to build cost-effective and easy-to-manage SANs that support the introduction of utility computing and Information Lifecycle Management (ILM) into the enterprise.

BROCADE

Figure 1. A SilkWorm 24000 core fabric surrounded by SilkWorm edge switches enables cost-effective, highly scalable enterprise SANs.
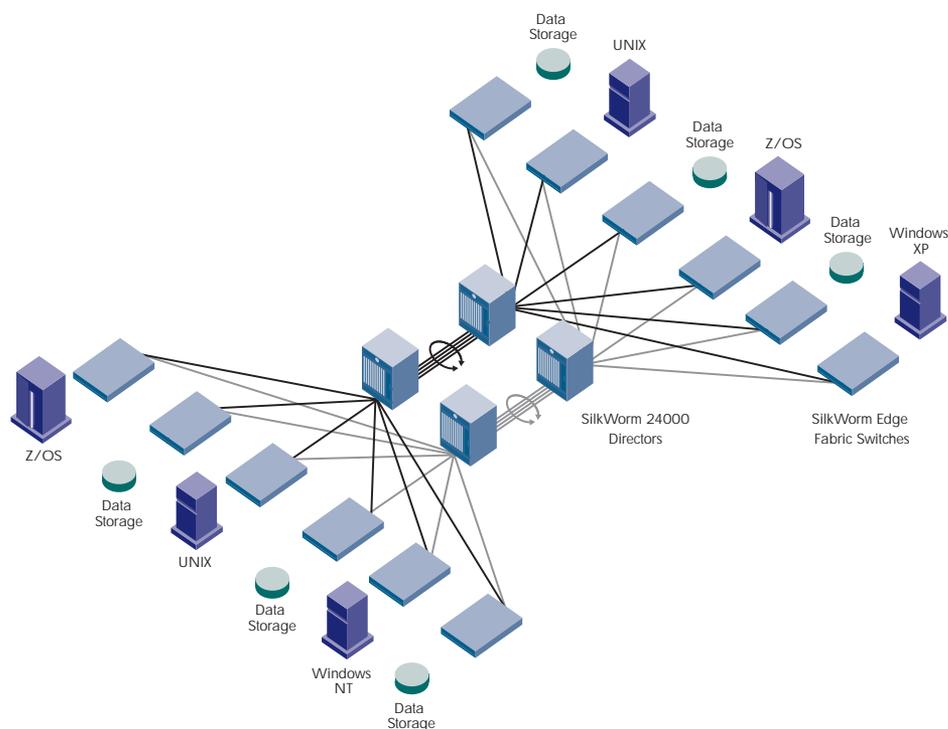
ULTRA-HIGH AVAILABILITY THROUGHOUT THE FABRIC

The core-to-edge SAN model features redundancy within the director as well as a high-availability network approach for the entire fabric. Combining the proven reliability of the SilkWorm family with ultra-high-availability features of the embedded Brocade Fabric OS operating system, the SilkWorm 24000 helps provide a SAN infrastructure capable of delivering continuous overall system availability. Key availability features include:

- Non-disruptive software upgrades and hot code activation
- Fabric Shortest Path First (FSPF) traffic rerouting
- 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 24000 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 a fully non-blocked architecture supporting 128 ports concurrently active at 2 Gbit/sec full-duplex, the SilkWorm 24000 facilitates better load balancing to support high-performance switching operations at the core of large SANs. The SilkWorm 24000 also employs a multistage shared memory architecture that improves performance by reducing latency in port-to-port transfers to 2.1 microseconds or less. To provide even higher performance, Brocade ISL Trunking combines up to four ISLs between a pair of switches into a single, logical high-speed trunk running at up to 8 Gbit/sec.

INTELLIGENT SAN MANAGEMENT AND MONITORING

The SilkWorm 24000 leverages Brocade Fabric OS, the embedded operating system, to centralize SAN management for greater

efficiency. This approach enables heterogeneous device connectivity, automatic data routing and rerouting, 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.

Organizations can also use Brocade Advanced Performance Monitoring to improve end-to-end performance analysis on a fabric-wide basis. This optional feature helps reduce storage costs by improving SAN performance tuning, resource optimization, and administrator productivity. Moreover, the Brocade Fabric Access API integrates with popular third-party storage management applications in Brocade SAN environments, enabling organizations to continue using their storage management tools of choice.

FICON SUPPORT FOR MAINFRAME ENVIRONMENTS

The SilkWorm 24000 supports the FICON protocol for mainframe environments, enabling organizations to utilize a single platform for both open systems and mainframe storage networks. The SilkWorm 24000 supports FICON intermix mode, the ability to run both open systems Fibre Channel and FICON traffic within a single director. The Brocade FICON implementation also supports cascaded FICON fabrics and both 1 and 2 Gbit/sec FICON speeds, with planned support for the CUP interface to use with SA/390, DCM, or RMF monitoring platforms.

SEAMLESS UPGRADES AND INVESTMENT PROTECTION

To help protect existing technology investments, the SilkWorm 24000 provides backward and forward compatibility with SilkWorm entry, midrange, and director offerings. Because the SilkWorm 24000 leverages field-proven components of the SilkWorm 12000, organizations can perform a field upgrade of existing SilkWorm 12000s by replacing the port cards and control processors. They can even intermix SilkWorm 12000 and SilkWorm 24000 blades in certain configurations.

The SilkWorm 24000 is also compatible with new Brocade offerings, providing "pay-as-you-grow" scalability and support for multiple protocols and future Fibre Channel speeds. In fact, the SilkWorm 24000 architecture is designed for blades that support IP protocols (FCIP and iSCSI) and faster Fibre Channel speeds (4 Gbit/sec and 10 Gbit/sec). These capabilities help "future-proof" the Silkworm 24000, giving organizations a reliable solution that can meet their needs 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 24000 DIRECTOR SPECIFICATIONS

Systems Architecture

Fibre Channel ports	128 ports, universal (E, F, and FL); up to eight 16-port Fibre Channel modules; up to 384 ports per 42U rack	**Switch latency**	<2.1 µsec any port to any port at 2 Gbit/sec, cut-through routing
Control processor	Redundant (active/standby) control processor modules	**Maximum frame size**	2112-byte payload
Scalability	Full fabric architecture 239 switches maximum	**Frame buffers**	108 per 4-port group, dynamically allocated
Certified maximum	32 switches, 7 hops; larger fabrics certified as required	**Classes of service**	Class 2, Class 3, Class F (inter-switch frames)
Interoperability	SilkWorm II, SilkWorm Express, any SilkWorm 2000 family switch, any SilkWorm 3000 family switch, SilkWorm 12000	**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
Performance	1.063 Gbit/sec line speed, full duplex; 2.125 Gbit/sec line speed, full duplex; auto-sensing of 1 Gbit/sec and 2 Gbit/sec port speeds; optionally programmable to fixed port speed; speed matching between 1 Gbit/sec and 2 Gbit/sec ports	**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 80 km (49.6 mi); distance depends on fiber optic cable and port speed
ISL Trunking	Up to four 2.125 Gbit/sec ports per ISL trunk; up to 8.5 Gbit/sec per ISL trunk	**Fabric services**	Simple Name Server; Registered State Change Notification (RSCN); Alias Server (multicast); Brocade Advanced Zoning, WEB TOOLS, Fabric Watch, Extended Fabrics, Remote Switch, ISL Trunking, and Advanced Performance Monitoring
Aggregate bandwidth	512 Gbit/sec end to end		

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; SNMP (FE MIB, FC Management MIB); WEB TOOLS; Fabric Watch; Fabric Access layer
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	88 to 96 kg (193 to 212 lb)

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)
Altitude	Up to 3000 meters (9800 feet)
Shock	Operating: 20 g, 6 ms duration, half-sine
Vibration	Operating: 0.5 g p-p, 5 to 500 to 5 Hz Non-operating: 2.0 g, 5 to 500 Hz
Heat dissipation	740 W, 2525 BTU/hr fully loaded

Power

Supported power range	Nominal: 200 to 240 VAC nominal, 5.0 A, single phase Operating: 180 to 264 VAC auto-sensing Maximum 2300 Volt-Amps Maximum 12 Amps
In-rush current	40 Amps maximum, peak
Frequency	47 to 63 Hz

Fibre Channel Standards

Standard	Revision
FC-AL	ANSI X3.272: 1996
FC-AL-2	NCITS 332: 1999
FC-BB	Rev 4.7
FC-BB-2	Rev 5.3
FC-DA	Rev 1.5
FC-FG	ANSI X3.289: 1996
FC-FLA	NCITS TR-20: 1998
FC-FS	Rev 1.7
FC-GS-2	Rev 5.3
FC-GS-3	Rev 7.01
FC-GS-4	Rev 7.6
FC-MI	Rev 1.92
FC-MI-2	Rev 2.1
FC-PI	Rev 1.3
FC-PLDA	NCITS TR-19: 1998
FC-SB-2	Rev 2.1
FC-SB-3	Rev 1.2
FC-SW-2	Rev 5.3
FC-SW-3	Rev 6.3
FC-TAPE	
FC-VI	Rev 1.61
FCP-2	Rev 7
FDMI	
IPFC	RFC 2625

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	EN55022 Level A
	TUV, NEMKO	EN55024
Australia/New Zealand		AS/NZS 3548 Class A
International	IEC 60950	CISPR 22 Class A