



The Brocade SilkWorm 4100 Fibre Channel switch combines up to 32 ports of 4 Gbit/sec performance with high availability and Ports on Demand to support mission-critical Storage Area Networks (SANs).

## SILKWORM 4100

### Highlights

- Protects existing investments by providing 4 Gbit/sec technology with auto-sensing capabilities to support earlier 1 and 2 Gbit/sec devices
- Supports full 4 Gbit/sec operations at distances up to 100 kilometers (or 500 kilometers at 1 Gbit/sec) for cost-effective business continuance
- Increases network performance with enhanced Brocade Inter-Switch Link (ISL) Trunking, which enables a high-speed data path up to 32 Gbit/sec
- Utilizes Ports on Demand for fast, easy, and cost-effective scalability from 16 to 32 ports in 8-port increments
- Meets high-availability requirements with redundant, hot-pluggable components, non-disruptive software upgrades, and hot code activation for a wide range of SAN configurations
- Leverages intelligent Brocade SAN management and monitoring tools to increase operational efficiency and maximize SAN investments

## A Flexible High-Performance Switch for a Variety of SAN Environments

The Brocade® SilkWorm® 4100 is a high-performance, high-availability Fibre Channel switch designed for rapidly growing storage requirements in mission-critical environments. With a flexible architecture that supports 1, 2, and 4 Gbit/sec technology with 16, 24, or 32 ports in a 1U package, the SilkWorm 4100 provides excellent value at an affordable price point. As a result, even small organizations can achieve the levels of performance and availability typically available only to larger enterprises.

The SilkWorm 4100 provides low-cost access to industry-leading SAN technology as well as support for “pay-as-you-grow” scalability through Ports on Demand capabilities. Because it is fully compatible with previous 1 and 2 Gbit/sec devices, it protects existing technology investments while providing a strategic solution for the future.

These capabilities help make the SilkWorm 4100 ideal for branch offices and departments in large enterprises as well as for mid-sized organizations. It can be used as the foundation of small standalone SANs or as an edge switch in larger core-to-edge SAN infrastructures for enterprise-class applications such as ERP, MRP, data warehousing, billing, and e-mail.

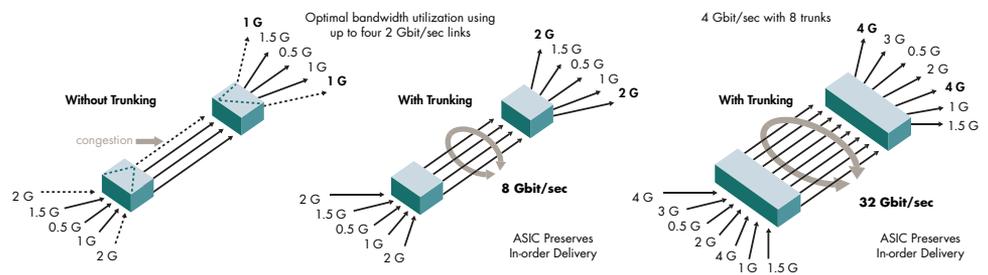
### INDUSTRY-LEADING PERFORMANCE

The SilkWorm 4100 provides best-in-class performance for midrange SAN switches to support mission-critical applications. It features a non-blocking architecture with as many as 32 ports concurrently active at 4 Gbit/sec full duplex to provide an aggregate bandwidth of 256 Gbit/sec.

The SilkWorm 4100 utilizes new ASIC technology featuring four 8-port groups. As a result, an Inter-Switch Link (ISL) trunk can have up

# HIGH PERFORMANCE

**Figure 1.**  
ISL Trunking with 1, 2, and 4 Gbit/sec links



to eight ports supplying as much as 32 Gbit/sec of data throughput (see Figure 1). In addition to reducing congestion between switches and providing greater total bandwidth, enhanced ISL Trunking utilizes ISLs more efficiently to free up the number of usable switch ports.

Additional performance capabilities include the following:

- Eight virtual channels on each ISL enhance Quality of Service traffic prioritization and anti-starvation capabilities at the port level to avoid performance degradation.
- 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 (see Figure 2). It augments ISL Trunking to provide more effective load balancing in certain configurations, such as routing data between

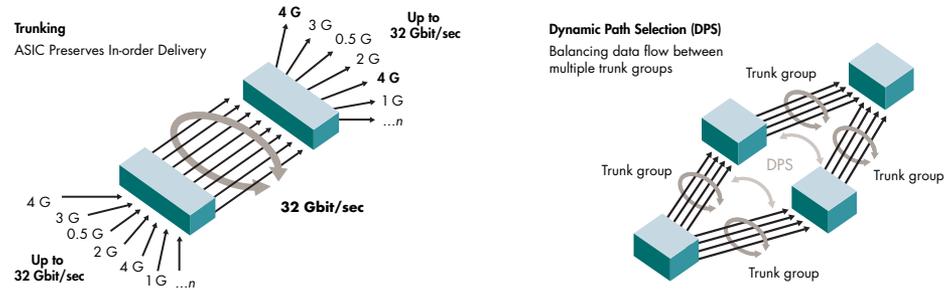
multiple trunk groups. As a result, a combination of DPS and ISL Trunking provides the greatest design flexibility and the highest degree of load balancing in the fabric.

## ENTERPRISE-CLASS AVAILABILITY FOR BUSINESS CONTINUANCE

With enterprise-class availability features such as hot-swappable redundant fans and power supplies, the SilkWorm 4100 provides a reliable foundation for disaster recovery and business continuance. Moreover, hot code activation helps maximize application uptime with faster system upgrades and maintenance that reduce the dependency on scheduled outages. Combined with a wide range of Brocade diagnostic and monitoring functions, these capabilities help provide a high-availability SAN environment.

To support disaster recovery and business continuance operations, the SilkWorm 4100 enables unprecedented distances between

**Figure 2.** Dynamic Path Selection augments ISL Trunking to route data efficiently between multiple trunk groups.



servers and storage devices. Support for distances up to 500 kilometers at 1 Gbit/sec and 100 kilometers at 4 Gbit/sec facilitates the deployment of high-performance, long-distance SAN solutions such as data center consolidation.

#### HIGH SCALABILITY WITH PORTS ON DEMAND

Delivering up to 32 ports in a 1U form factor, the SilkWorm 4100 combines the cost-effectiveness of a switch designed for a variety of SAN environments with highly scalable Ports on Demand capabilities. The SilkWorm 4100 comes with a minimum of 16 ports enabled, and organizations can easily expand the number of ports to 24 or 32 by activating a license as their requirements change. Because the SilkWorm 4100 is easily upgradeable, it extends the Brocade modular “pay-as-you-grow” approach to support cost-effective business growth.

#### SUPERIOR ROI AND INVESTMENT PROTECTION

The SilkWorm 4100 combines strategic performance, availability, and scalability advantages with investment protection for existing SAN environments. For instance, auto-sensing capabilities for 1, 2, and 4 Gbit/sec ports enable rapid implementation in existing SAN

environments—reducing both deployment cost and complexity.

The SilkWorm 4100 utilizes the same Brocade Fabric OS® code stream that supports the SilkWorm product line—from the 8-port SilkWorm 3250 to the 128-port SilkWorm 24000. This ensures full forward and backward compatibility among SilkWorm switches while simplifying software maintenance and field upgrades. As a result, the SilkWorm 4100 enables organizations to better leverage their current training, tools, devices, and processes.

#### OPEN SAN MANAGEMENT

By networking Fibre Channel switches such as the SilkWorm 4100 under a common platform, Fabric OS greatly simplifies SAN management. An embedded real-time operating system, Fabric OS includes standard management interfaces, a full range of management tools, and support for third-party SAN management applications.

To simplify SAN administration and reduce costs, the SilkWorm 4100 supports switch management through a command line interface, Brocade Web Tools, or Brocade Fabric Manager. It also leverages Brocade Advanced Fabric Services to improve

the utilization of existing storage and server assets, increase administrator efficiency, and lower the cost of storage management.

To facilitate deployment, the SilkWorm 4100 integrates easily into heterogeneous environments such as Windows NT, UNIX, Linux, Solaris, and AIX.

#### HIGHER FABRIC SECURITY FOR CRITICAL INFORMATION

The SilkWorm 4100 is designed for the highest level of SAN fabric security to help organizations safeguard their critical information. It utilizes Brocade Zoning, Brocade Advanced Zoning, and Secure Fabric OS® to help organizations simplify administration and significantly increase their control over data access.

#### MAXIMIZING SAN INVESTMENTS

Brocade and Dell 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 your Dell sales representative or visit [www.Dell.com](http://www.Dell.com).

# SILKWORM 4100

## Systems Architecture

<b>Fibre Channel ports</b>	32 ports, universal (E, F, and FL)
<b>Scalability</b>	Full fabric architecture with 239 switches maximum
<b>Certified maximum</b>	50 switches, 7 hops; larger fabrics may be certified as required
<b>Interoperability</b>	SilkWorm 2000 and 3000 series switches; SilkWorm 12000 and 24000 directors
<b>Performance</b>	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 Gbit/sec, 2 Gbit/sec, and 4 Gbit/sec port speeds; optionally programmable to fixed port speed; speed matching between 1, 2, and 4 Gbit/sec ports
<b>ISL Trunking</b>	Up to eight 4.25 Gbit/sec ports per ISL trunk; up to 32 Gbit/sec per ISL trunk
<b>Aggregate bandwidth</b>	256 Gbit/sec end to end
<b>Fabric latency</b>	<2.1 $\mu$ sec. with no contention, cut-through routing at 4 Gbit/sec
<b>Maximum frame size</b>	2112-byte payload
<b>Classes of service</b>	Class 2, Class 3, Class F (inter-switch frames)
<b>Port types</b>	FL_Port, F_Port, and E_Port; self-discovery based on switch type (U_Port)
<b>Data traffic types</b>	Fabric switches supporting unicast and broadcast
<b>Media types</b>	Small Form-factor Pluggable (SFP) media; short-wave up to 500 meters (1640 feet); long-wave up to 10 kilometers (6.2 miles); extended long-wave up to 100 km (62.1 mi). Distance depends on fiber optic cable and port speed.
<b>Fabric services</b>	Simple Name Server, Registered State Change Notification (RSCN). Optional fabric services include: Brocade Advanced Zoning; Brocade Fabric Watch; Brocade Extended Fabrics; Brocade Remote Switch; Brocade ISL Trunking; Brocade Advanced Performance Monitoring; Brocade Web Tools
<b>Options</b>	SFP Media

## Management

<b>Management software supported</b>	Telnet; SNMP (FE MIB, FC Management MIB); Brocade Advanced Web Tools (optional); Brocade Fabric Manager (optional)
<b>Management access</b>	10/100 Ethernet port (RJ-45); Serial port (RS-232); in-band through Management Server
<b>Diagnostics</b>	POST and embedded online/offline diagnostics

## Mechanical Specifications

<b>Enclosure</b>	Back-to-front airflow (non-Fibre Channel port side to Fibre Channel port side). Power from rear. 1.0U, 19-inch EIA compliant
<b>Size</b>	Width: 42.90 cm (16.89 in) Height: 4.24 cm (1.67 in) Depth: 58.42 cm (23.00 in)
<b>System weight</b>	9.25 kg (20.4 lb) with single power supply, no SFP 10.16 kg (22.4 lb) with dual power supplies, no SFP
<b>Environment</b>	
<b>Temperature</b>	Operating: 0°C to 40°C (32°F to 104°F) Non-operating: -25°C to 70°C (-13°F to 158°F)
<b>Humidity</b>	Operating: 20 to 85 percent non-condensing at 40°C (104°F)
<b>Altitude</b>	Operating: Up to 3000 meters (9842 feet) Storage: Up to 12 kilometers (39,370 feet)
<b>Shock</b>	Operating: 20 g, 6 ms half-sine Non-operating: 15 g, 12-18 ms trapezoid
<b>Vibration</b>	Operating: 0.5 g sine, 0.4 grms random, 5 to 500 Hz Non-operating: 2.0 g sine, 1.1 grms random, 5 to 500 Hz
<b>Airflow</b>	
<b>High speed</b>	40 CFM (cu. ft./min)
<b>Low speed (65%)</b>	27.5 CFM
<b>Power</b>	
<b>Maximum output</b>	210 Watts
<b>System power consumption</b>	120 Watts max, 80 Watts typical
<b>Nominal input voltage</b>	100 to 240 VAC, Universal
<b>Input line frequency</b>	47 to 63 Hz
<b>Minimum input voltage</b>	90 VAC
<b>Maximum input voltage</b>	260 VAC
<b>BTU rating (80% efficiency)</b>	512 BTU/hr
<b>Inrush current</b>	Maximum of 15 amps for period between 10 to 150 ms at 50° Celsius (122° Fahrenheit)

## Safety

The SilkWorm 4100 complies with the following safety certifications:  
UL 60950-1: 2003, First Edition (Underwriters Laboratory); CSA 60950-1-03  
(Canadian Standards Association); Nemko EN60950: 2000; TUV EN60950:  
2000 / IEC60950:1999 (TUV "GS" for Germany, TUV "S" for Argentina);  
GOST (Russia); Low Voltage Directive (73/23/EEC) for CE Marking in European Union

