BROCADE FABRIC OS

STORAGE AREA NETWORK

The Platform for Intelligent SAN Fabrics

HIGHLIGHTS

- Provides high-speed access to mission-critical information
- Supports highly resilient, fault-tolerant multiswitch Brocade SAN fabrics
- Facilitates SAN fabric scaling through Brocade Ports on Demand technology
- Integrates existing 1 and 2 Gbit/sec SAN fabrics with 4 Gbit/sec switches and devices
- Supports optional Brocade Advanced Fabric Services for the most demanding business environments
- Features 1, 2, and 4 Gbit/sec FICON® connectivity for IBM zSeries server environments
- Maximizes port usage with N_Port Virtualization (NPIV) technology
- Provides data management and fault isolation capabilities for virtual fabrics via Administrative Domain, Advanced Zoning, and Logical SAN (LSAN) zoning technologies

Brocade® Fabric OS® is the operating system firmware that provides the core infrastructure for deploying robust storage networks. As the foundation for the Brocade family of Fibre Channel Storage Area Network (SAN) switches and directors, Fabric OS helps ensure the reliable and high-performance data transport that is critical for scalable SAN fabrics interconnecting thousands of servers and storage devices.

With ultra-high-availability features such as non-disruptive hot code activation, Fabric OS is designed to support mission-critical enterprise environments. A highly flexible solution, Fabric OS is built with field-proven features such as fabric auditing, continuous port monitoring, advanced diagnostics and recovery, and data management/fault isolation. In addition, Fabric OS supports a wide range of optional Brocade Advanced Fabric Services.

FOUNDATION FABRIC SERVICES FOR MISSION-CRITICAL ENVIRONMENTS

To support highly scalable, reliable, and manageable SAN environments, Fabric OS provides a wide range of services for Brocade switches, directors, and embedded switches in blade server environments. These services include:

- Ultra-high availability
- Strong SAN fabric security
- Simplified management, support, and diagnostics
- Efficient connectivity and data routing
- FICON connectivity
- Extended distance support
- Multilayer services for the Brocade 7500 and Brocade 48000
- Data management and fault isolation for virtual fabrics

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ULTRA-HIGH-AVAILABILITY SERVICES

Fabric OS provides ultra-high-availability services designed specifically for enterprise SAN environments, including:

- **Non-disruptive hot code activation:** Supports mission-critical environments by enabling operating system upgrades without downtime or disruption to data traffic in the SAN. This capability is available for the Brocade 200E, Brocade 4100, Brocade 4900, Brocade 7500, and Brocade 48000.
- **Support for Brocade SAN directors:** Enables background monitoring of standby control processors. In the event of a failure, non-disruptive failover of control processors occurs automatically while traffic flows uninterrupted through the SAN. In addition, World Wide Name (WWN) card hot-swap capabilities support robust core-to-edge SAN implementations. Because port and control processor blades are interchangeable among Brocade director chassis, organizations can easily upgrade to higher-density configurations.

STRONG SAN FABRIC SECURITY SERVICES

Fabric OS enables the most secure SAN environments possible by supporting:

- Secure Shell (SSH) for encrypted telnet sessions to switches
- Enhanced user authentication through RADIUS
- Standards-based inter-switch authentication through the FCAP and DH-CHAP authentication protocols
- Device and switch connection control
- Optional Brocade Secure Fabric OS® and Advanced Zoning
- Auditing of events such as configuration changes or security violations

SIMPLIFIED MANAGEMENT SERVICES

Fabric OS includes a comprehensive set of capabilities for complete end-to-end SAN management, including:

- **State Change Notification (SCN) filtering:** Reduces SCN traffic in the SAN by filtering SCNs and sending them only to other members of a given zone, rather than throughout the entire SAN.
- **Simple Name Server (SNS):** Incorporates the latest Fibre Channel standards, registering information about SAN hosts and storage devices as well as providing Registered State Change Notifications (RSCNs).
- **Alias Server:** Supports the multicast services that broadcast data to all members of a group.
- **Time Services:** Provide fabric-wide time synchronization from an external timeserver—enabling time correlation of fabric events and time zone support for Daylight Saving Time.
- **Port naming:** Simplifies management tasks by enabling administrators to associate specific switch ports with symbolic and meaningful names.
- **Fabric Device Management Interface (FDMI) support:** Enables Host Bus Adapter (HBA) management through the SAN fabric, including firmware downloads, digital certificate authentication, and other security capabilities.
- **Brocade Web Tools:** Provides an easy-to-use GUI for managing individual switches and small fabrics in the SAN.
- **A comprehensive Command Line Interface (CLI):** Enables task automation through scripting mechanisms via the switch front panel, serial port, or telnet.
- **Role-based access control:** Reduces the complexity and cost of security administration in large networked applications by enabling different administrative roles for various job functions.
- **Simple Network Management Protocol (SNMP)-based services:** Include services such as:
  - An SNMP agent and Management Information Bases (MIBs) help monitor and configure switches.
  - Management is enabled via in-band (over IP or a Fibre Channel link) and out-of band (via external Ethernet interfaces) mechanisms.
  - A syslog daemon directs exception messages to as many as six recipients for seamless integration with host-based management frameworks.

EFFICIENT CONNECTIVITY AND ROUTING SERVICES

To help increase availability and maximize performance, Fabric OS dynamic routing services provide the following capabilities:

- **Routing flexibility:** Provides a choice in routing strategies from dynamic (exchange-based, device-based, or frame-based) alternatives.
- **In-order frame delivery:** Guarantees that frames arrive in order.
- **Dynamic path selection via link state protocols:** Uses the industry-standard Fabric Shortest Path First (FSPF) algorithm to select the most efficient route for transferring data in multiswitch environments.
- **Load sharing to maximize throughput across ISLs:** Increases throughput by supporting multiple Inter-Switch Links (ISLs).
- **Automatic path failover:** Reconfigures alternate paths when a link fails, then distributes the new configuration fabric-wide and reroutes traffic without manual intervention.
- **Automatic reconfiguration:** Reroutes data traffic onto new ISLs as they join the SAN fabric.
- **Static routing support:** Enables the configuration of fixed routes for certain data traffic and helps ensure resiliency during link failures.
- **Routing support for link costs:** Enables the manual configuration of link costs of individual ISLs to influence traffic flow patterns across the fabric.
- **Support for high-priority protocol frames:** Helps ensure that certain frames receive priority routing to minimize latency, which benefits clustering applications.
- **Seamless integration into WAN gateways via an E_Port:** Enables the specification of R_RDY flow control for use by gateways, and is configurable on a port-by-port basis.
- **N_Port ID Virtualization (NPIV) support:** Allows each host image behind the same physical HBA to connect to an F_Port using a unique N_Port ID. This technology maximizes the port usage on the switch.

FICON CONNECTIVITY FOR MAINFRAME ENVIRONMENTS

Fabric OS provides a single platform that supports both open systems Fibre Channel and mainframe-based FICON storage traffic on a port-by-port basis in intermix mode. It supports cascaded FICON fabrics as well as 1, 2, and 4 Gbit/sec FICON speeds. In addition, FICON CUP capabilities enable legacy management applications to seamlessly support Brocade FICON environments.

EXTENDED DISTANCE SUPPORT

To extend the reach of storage environments across longer distances, Fabric OS and optional Brocade Extended Fabrics software support up to 500 kilometers between hosts and storage devices, depending on the connectivity bandwidth (1, 2, and 4 Gbit/sec link speeds are available).

RELIABLE SUPPORT AND DIAGNOSTIC SERVICES FOR FAULT ISOLATION

Key Fabric OS support services include:

- **Call Home capability:** Enables the SAN fabric to proactively report critical exception conditions so administrators can correct potential problems before they disrupt operations.
- **Port mirroring:** Helps troubleshoot Fibre Channel end-to-end link communication by capturing data traffic between devices and mirroring it to another port—without interrupting production traffic.

MULTILAYER SERVICES

To help organizations maximize the value of their SANs, Fabric OS provides a set of multilayer services that increase SAN functionality, scalability, and versatility:

- **FC-FC Routing Service:** Provides device connectivity between two or more fabrics without merging those fabrics.
- **FCIP Tunneling Service:** Enables organizations to extend Fibre Channel SANs over longer distances that would be impractical with native Fibre Channel links, or situations where dark fiber links would be impractical but in which IP WANs already exist.
- **iSCSI Service:** Allows iSCSI-enabled servers to connect to Fibre Channel SAN storage, protecting investments while enabling efficient, cost-effective SAN expansion.

DATA MANAGEMENT AND FAULT ISOLATION FOR VIRTUAL FABRICS

Fabric OS enables organizations to isolate information and applications for separate management. Brocade Virtual Fabrics uses Advanced Zoning and LSAN zoning to prevent unintentional data transfer while Administrative Domain technology provides independent instantiations of fabrics services—isolating failures from other virtual fabrics.

OPTIONAL ADVANCED FABRIC SERVICES

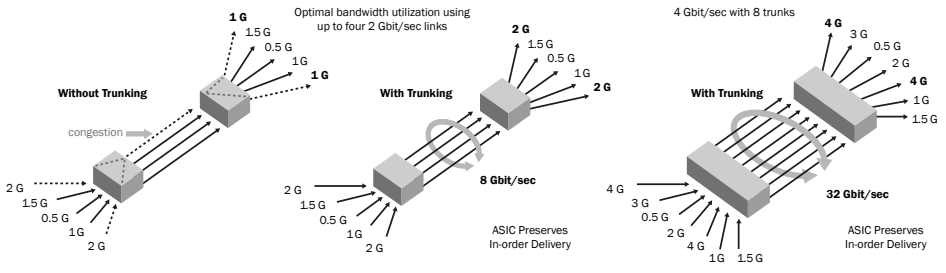
To address the most challenging storage network requirements, Brocade offers a unique family of optional Advanced Fabric Services that build upon the foundation services of Fabric OS. These innovative services include:

- **Brocade Advanced Performance Monitoring:** Enables end-to-end SAN performance analysis to enhance performance tuning, increase productivity, optimize resource utilization, and reduce costs.
- **Brocade Advanced Zoning:** Automatically groups SAN devices into logical zones that restrict access to "member" devices in the zone. Advanced Zoning uses hardware enforcement at both the port and WWN level.
- **Brocade Fabric Watch:** Continuously monitors SAN fabrics for potential faults—automatically alerting administrators to potential problems before they become costly failures.
- **Brocade ISL Trunking:** Optimizes the performance and availability of SAN fabrics while simplifying ISL management. Two 4 Gbit/sec Brocade switches can automatically group up to eight ISLs into a single logical "trunk" with a total throughput of up to 32 Gbit/sec (see Figure 1).
- **Brocade Extended Fabrics:** Supports the reliable, high-speed connectivity of Brocade switches over dark fiber or Dense Wave Division Multiplexing (DWDM) equipment at distances up to 500 kilometers.

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.

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



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