Brocade 6510 Switch

HIGHLIGHTS

- Provides exceptional price/performance value, combining flexibility, simplicity, and enterprise-class functionality in a 48-port switch

- Enables fast, easy, and cost-effective scaling from 24 to 48 ports

- Leverages Brocade Fabric Vision technology's powerful monitoring, management, and diagnostic tools to simplify administration, increase uptime, and reduce costs

- Helps pinpoint problems faster and simplify SAN configuration and management with Brocade Network Advisor

- Simplifies deployment with the Brocade EZSwitchSetup wizard and supports high-performance fabrics by using Brocade ClearLink D_Ports to identify optic and cable issues

- Maximizes availability with redundant, hot-pluggable components and non-disruptive software upgrades

Flexible, Easy-to-Use Enterprise-Class SAN Switch for Private Cloud Storage

To keep pace with growing business demands, data centers are transitioning to highly virtualized, private cloud storage environments. This approach enables organizations to consolidate and simplify their IT resources, resulting in increased business agility and lower capital and operating expenses. But virtualization is not without its challenges. Data centers must keep up with the explosive data growth and dynamic changes driven by virtualized workloads. Selecting the right network is key to realizing the full benefits of these cloud-based architectures.

The Brocade® 6510 Switch meets the demands of hyper-scale, private cloud storage environments by delivering market-leading Gen 5 Fibre Channel technology and capabilities that support highly virtualized environments. Designed to enable maximum flexibility and reliability, the Brocade 6510 is a high-performance, enterprise-class switch configurable in 24, 36, or 48 ports. It supports 2, 4, 8, 10, or 16 Gbps speeds in an efficiently designed 1U package.

A simplified deployment process and a point-and-click user interface make the Brocade 6510 both powerful and easy to use. The Brocade 6510 offers low-cost access to industry-leading Storage Area Network (SAN) technology while providing "pay-as-you-grow" scalability to meet the needs of an evolving storage environment.

Exceptional Price/Performance for Growing SAN Workloads

The Brocade 6510 with Gen 5 Fibre Channel delivers exceptional price/performance for growing SAN workloads through a combination of market-leading throughput and an affordable switch form factor. The 48 ports produce an aggregate 768 Gbps full-duplex throughput; any eight ports can be trunked for 128 Gbps Inter-Switch Links (ISLs). 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 1). It augments Brocade ISL Trunking to provide more effective load balancing in certain configurations.

Gen 5 Fibre Channel is the purpose-built, data center-proven network infrastructure for storage, delivering unmatched reliability, simplicity, and 16 Gbps performance. The Brocade 6510 with Gen 5 Fibre Channel and Brocade Fabric Vision technology unleashes the full potential of high-density server virtualization, cloud architectures, and next-generation storage.

Moreover, a 24-port base configuration, easy administration, 1U footprint, and low-energy consumption—0.14 watts per Gbps and 2.3 watts per port—provide a low Total Cost of Ownership (TCO). Enterprise-class capabilities combined with a low TCO yield 40 percent higher performance compared to 10 Gigabit Ethernet (GbE) alternatives at a similar cost.
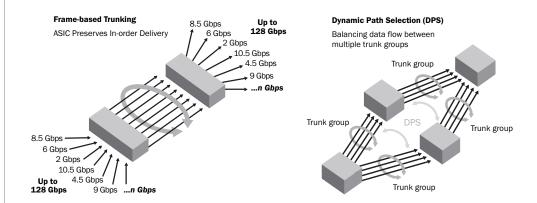
Industry-Leading Technology That Is Flexible, Simple, and Easy to Use

The Brocade 6510 delivers industry-leading SAN technology within a flexible, simple, and easy-to-use solution. The base configuration includes 24 ports, with up to 48 ports on demand. In addition to providing best-in-class scalability, the Brocade 6510 is easy to deploy with the Brocade EZSwitchSetup wizard and ClearLink Diagnostic Ports (D_Ports) feature, which simplifies setup. For maximum flexibility, the switch also features a 1U case less than 18 inches deep and dual-direction airflow options to support the latest hot aisle/cold aisle configurations.

A Building Block for Virtualized, Private Cloud Storage

The Brocade 6510 provides a critical building block for today's highly virtualized, private cloud storage environments. It simplifies server virtualization and Virtual Desktop Infrastructure (VDI) management while meeting the high-throughput demands of Solid State Disks (SSDs). The Brocade 6510 also supports multitenancy in cloud environments through Virtual Fabrics, Quality of Service (QoS), and fabric-based zoning features.

The Brocade 6510 enables secure metro extension to virtual private or hybrid clouds with 10 Gbps Dense Wavelength Division Multiplexing (DWDM) link support, as well as in-flight encryption and data compression over ISLs. Organizations can have up to four ports at 8 Gbps and up to two at 16 Gbps of in-flight encryption and data compression per Brocade 6510 Switch. The switch also features on-board data security and acceleration, minimizing the need for separate acceleration appliances to support distance extension. Internal fault-tolerant and enterprise-class RAS features help minimize downtime to support mission-critical cloud environments.

Figure 1: Dynamic Path Selection (DPS) augments Brocade ISL Trunking to route data efficiently between multiple trunk groups.

Brocade Access Gateway Mode

The Brocade 6510 can be deployed as a full-fabric switch or as a Brocade Access Gateway, which simplifies fabric topologies and heterogeneous fabric connectivity (the default mode setting is a switch). Brocade Access Gateway mode utilizes N_Port ID Virtualization (NPIV) switch standards to present physical and virtual servers directly to the core of SAN fabrics. This makes it transparent to the SAN fabric, greatly reducing management of the network edge. The Brocade 6510 in Brocade Access Gateway mode* can connect servers to NPIV-enabled Brocade B-Series, Brocade M-Series, or other SAN fabrics.

Organizations can easily enable Brocade Access Gateway mode via Brocade Network Advisor or a CLI. Key benefits of Brocade Access Gateway mode include:

- Improved scalability for large or rapidly growing server and virtual server environments

- Reduced management of the network edge, since Brocade Access Gateway does not have a domain identity and appears transparent to the core fabric

- Support for heterogeneous SAN configurations without reduced functionality for server connectivity

Simplified Management and Robust Network Analytics

Brocade Fabric Vision™ technology provides a breakthrough hardware and software solution that helps simplify monitoring, maximize network availability, and dramatically reduce costs. Featuring innovative monitoring, management, and diagnostic capabilities, Fabric Vision technology enables administrators to avoid problems before they impact operations, helping their organizations meet Service Level Agreements (SLAs).

Fabric Vision technology includes:

- **Monitoring and Alerting Policy Suite (MAPS):** Provides an easy-to-use solution for pre-built, policy-based threshold monitoring and alerting. MAPS proactively monitors the health and performance of the SAN infrastructure to ensure application uptime and availability. By leveraging pre-built, rule-/policy-based templates, MAPS simplifies fabric-wide threshold configuration, monitoring, and alerting. Administrators can configure the entire fabric (or multiple fabrics) at one time using common rules and policies, or customize policies for specific ports or switch elements.

- **Fabric Performance Impact (FPI) Monitoring:** Leverages pre-defined MAPS policies to automatically detect and alert administrators to different latency severity levels, and identifies slow drain devices that could impact network performance. This feature uses advanced monitoring capabilities and intuitive MAPS dashboard reporting to indicate various latency severity levels, pinpointing exactly which devices are causing or are impacted by a bottlenecked port.

- **Dashboards:** Provides integrated dashboards that display an overall SAN health view, along with details on out-of-range conditions, to help administrators easily identify trends and quickly pinpoint issues occurring on a switch or in a fabric.

- **Configuration and Operational Monitoring Policy Automation Services Suite (COMPASS):** Simplifies deployment, safeguards consistency, and increases operational efficiencies of larger environments with automated switch and fabric configuration services. Administrators can configure a template or adopt an existing configuration as a template and seamlessly deploy

Brocade Fabric Vision technology, an extension of Gen 5 Fibre Channel, provides unprecedented insight and visibility across the storage network with powerful built-in monitoring, management, and diagnostic tools that enable organizations to:

- Simplify monitoring:
  - Deploy more than 15 years of SAN best practices in one click to simplify the deployment of monitoring with pre-defined, threshold-based rules, actions, and policies
  - Gain comprehensive visibility into network health, performance, latency and congestion issues in the fabric using browser-accessible dashboards with drill-down and point-in-time playback capabilities

- Increase availability:
  - Avoid 50 percent of common network problems with proactive monitoring and advanced diagnostic tools that address problems before they impact operations
  - Identify hot spots and automatically mitigate network problems—before they impact application performance—through intuitive reporting, trend analysis, and integrated actions

- Dramatically reduce costs:
  - Eliminate nearly 50 percent of maintenance costs through automated testing and diagnostic tools that validate the health, reliability, and performance of the network prior to deployment
  - Save up to millions of dollars on CapEx costs by eliminating the need for expensive third-party tools through built-in monitoring and diagnostics

* Note: Brocade Access Gateway mode for the Brocade 6510 is supported only in 48-port configurations.

the configuration across the fabric. In addition, they can ensure that settings do not drift over time with COMPASS configuration and policy violation monitoring within Brocade Network Advisor dashboards.

- **Brocade ClearLink Diagnostics:** Ensures optical and signal integrity for Gen 5 Fibre Channel optics and cables, simplifying deployment and support of high-performance fabrics. ClearLink Diagnostic Port (D_Port) is an advanced capability of Gen 5 Fibre Channel platforms.

- **Flow Vision:** Enables administrators to identify, monitor, and analyze specific application flows in order to simplify troubleshooting, maximize performance, avoid congestion, and optimize resources. Flow Vision includes:

  - **Flow Monitor:** Provides comprehensive visibility into flows within the fabric, including the ability to automatically learn flows and non-disruptively monitor flow performance. Administrators can monitor all flows from a specific host to multiple targets/LUNs, from multiple hosts to a specific target/LUN, or across a specific ISL. Additionally, they can perform LUN-level monitoring of specific frame types to identify resource contention or congestion that is impacting application performance.

  - **Flow Generator:** Provides a built-in traffic generator for pre-testing and validating the data center infrastructure—including route verification and integrity of optics, cables, ports, back-end connections, and ISLs—for robustness before deploying applications.

- **Forward Error Correction (FEC):** Enables recovery from bit errors in ISLs, enhancing transmission reliability and performance.

- **Credit Loss Recovery:** Helps overcome performance degradation and congestion due to buffer credit loss.

Brocade Network Advisor

Brocade Network Advisor simplifies Gen 5 Fibre Channel management and helps users proactively diagnose and resolve issues to maximize uptime, increase operational efficiency, and reduce costs. The wizard-driven interface dramatically reduces deployment and configuration times by allowing fabrics, switches, and ports to be managed as groups. Customizable dashboards graphically display performance and health indicators out of the box, including all data captured using Brocade Fabric Vision technology. To accelerate troubleshooting, administrators can use dashboard playback to quickly review past events and identify problems in the fabric. In addition, dashboards and reports can be configured to show only the most relevant data, enabling administrators to more efficiently prioritize their actions and maintain network performance.

Brocade Global Services

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 15 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, network monitoring services, and education, enabling organizations to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

Maximizing Investments

To help optimize technology investments, Brocade and its partners offer complete solutions that include professional services, technical support, and education. For more information, contact a Brocade sales partner or visit www.brocade.com.

BROCADE 6510 SPECIFICATIONS

Systems Architecture

Fibre Channel ports	**Switch mode (default):** 24-, 36-, and 48-port configurations (12-port increments through Ports on Demand [PoD] licenses); E, F, M, D, EX ports **Brocade Access Gateway default port mapping:** 40 F_Ports, 8 N_Ports
Scalability	Full fabric architecture with a maximum of 239 switches
Certified maximum	6,000 active nodes; 56 switches, 19 hops in Brocade Fabric OS® fabrics; larger fabrics certified as required
Performance	Fibre Channel: 2.125 Gbps line speed, full duplex; 4.25 Gbps line speed, full duplex; 8.5 Gbps line speed, full duplex; 10.53 Gbps line speed, full duplex; 14.025 Gbps line speed, full duplex; auto-sensing of 2, 4, 8, and 16 Gbps port speeds; 10 Gbps optionally programmable to fixed port speed
ISL trunking	Frame-based Trunking with up to eight 16 Gbps ports per ISL trunk; up to 128 Gbps per ISL trunk. Exchange-based load balancing across ISLs with DPS included in Brocade Fabric OS.
Aggregate bandwidth	768 Gbps end-to-end full duplex
Maximum fabric latency	Latency for locally switched ports is 700 ns; encryption/compression is 5.5 µsec per node; Forward Error Correction (FEC) adds 400 ns between E_Ports (enabled by default).
Maximum frame size	2,112-byte payload
Frame buffers	8,192 dynamically allocated
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	D_Port (ClearLink Diagnostic Port), E_Port, EX_Port, F_Port, M_Port (Mirror Port); optional port type control Brocade Access Gateway mode: F_Port and NPIV-enabled N_Port
Data traffic types	Fabric switches supporting unicast

Media types	**16 Gbps:** Brocade 6510 requires Brocade hot-pluggable SFP+, LC connector; 16 Gbps SWL, LWL, ELWL **10 Gbps:** Brocade 6510 requires Brocade hot-pluggable SFP+, LC connector; 10 Gbps SWL, LWL **8 Gbps:** Brocade 6510 requires Brocade hot-pluggable SFP+, LC connector; 8 Gbps SWL, LWL, ELWL Fibre Channel distance subject to fiber-optic cable and port speed
USB	One USB port for system log file downloads or firmware upgrades
Fabric services *Note: Some fabric services do not apply or are unavailable in Brocade Access Gateway mode.*	Monitoring and Alerting Policy Suite (MAPS); Flow Vision; Top Talkers for E_Ports, F_Ports, and Fabric mode; Brocade Adaptive Networking (Ingress Rate Limiting, Traffic Isolation, QoS); Bottleneck Detection; Brocade Advanced Zoning (default zoning, port/WWN zoning, broadcast zoning, peer zoning); Dynamic Fabric Provisioning (DFP); Dynamic Path Selection (DPS); Brocade Extended Fabrics; Enhanced BB credit recovery; FDMI; Frame Redirection; Frame-based Trunking; FSPF; Integrated Routing; IPoFC; Brocade ISL Trunking; Management Server; NPIV; NTP v3; Port Fencing; Registered State Change Notification (RSCN); Reliable Commit Service (RCS); Server Application Optimization (SAO); Simple Name Server (SNS); Virtual Fabrics (Logical Switch, Logical Fabric)
Extension	Fibre Channel, in-flight compression (Brocade LZO) and encryption (AES-GCM-256); integrated optional 10 Gbps Fibre Channel for DWDM MAN connectivity

Management

Supported management software	HTTP, SNMP v1/v3 (FE MIB, FC Management MIB), SSH; Auditing, Syslog; Brocade Advanced Web Tools; Brocade Network Advisor SAN Enterprise or Brocade Network Advisor SAN Professional/Professional Plus; Command Line Interface (CLI); SMI-S compliant; Administrative Domains; trial licenses for add-on capabilities

BROCADE 6510 SPECIFICATIONS (Continued)

Management (Continued)

Security	AES-GCM-256 encryption on ISLs; DH-CHAP (between switches and end devices), FCAP switch authentication; FIPS 140-2 L2-compliant, HTTPS, IPsec, IP filtering, LDAP with IPv6, OpenLDAP, Port Binding, RADIUS, TACACS+, User-defined Role-Based Access Control (RBAC), Secure Copy (SCP), Secure RPC, SFTP, SSH v2, SSL, Switch Binding, Trusted Switch
Management access	10/100 Mbps Ethernet (RJ-45), in-band over Fibre Channel, serial port (RJ-45), and one USB port
Diagnostics	ClearLink optics and cable diagnostics, including electrical/optical loopback, link traffic/latency/distance; flow mirroring; built-in flow generator; POST and embedded online/offline diagnostics, including environmental monitoring, FCping and Pathinfo (FC traceroute), frame viewer, non-disruptive daemon restart, port mirroring, optics health monitoring, power monitoring, RAStrace logging, and Rolling Reboot Detection (RRD)

Mechanical

Enclosure	Front-to-back airflow; power from back, 1U
	Back-to-front airflow; power from back, 1U
Size	**Width:** 437.64 mm (17.23 in.)
	Height: 43.18 mm (1.7 in.)
	Depth: 443.23 mm (17.45 in.)
System weight	9.16 kg (20.20 lb) with two power supply FRUs, without transceivers

Environment

Operating environment	**Temperature:** 0° to 40°C/32°F to 104°F
	Humidity: 10% to 85% (non-condensing)
Non-operating environment	**Temperature:** −25° to 70°C/−13°F to 158°F
	Humidity: 10% to 90% (non-condensing)
Operating altitude	Up to 3,000 m (9,842 ft)
Storage altitude	Up to 12 km (39,370 ft)
Shock	**Operating:** Up to 20 G, 6 ms half-sine
	Non-operating: Half sine, 33 G 11 ms, 3/eg axis
Vibration	**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
Heat dissipation	48 ports at 375 BTU/hr

Power

Power supply	Dual, hot-swappable redundant power supplies with integrated system cooling fans
AC input	85 V to 264 V ~5 A to 2.5 A
AC input line frequency	47 Hz to 63 Hz
AC power consumption	110 W with all 48 ports populated with 16 Gbps SWL optics
	72 W for empty chassis with no optics
DC input	40 V to 60 V max current 4.5 A
DC power consumption	112 W with all 48 ports populated with 16 Gbps SWL optics
	53 W for empty chassis with no optics

For information about supported SAN standards, visit www.brocade.com/sanstandards.

For information about switch and device interoperability, visit www.brocade.com/interoperability.

For information about hardware regulatory compliance, visit www.brocade.com/regulatorycompliance.

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