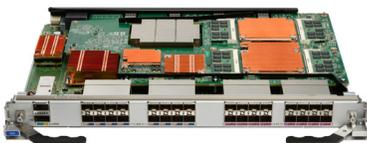DATA SHEET

Brocade SX6 Extension Blade

HIGHLIGHTS

- Accelerates data replication across data centers to meet recovery objectives and secure data flows over distance

- Consolidates Fibre Channel and IP storage replication traffic within a single blade with flexible multiprotocol port connectivity

- Connects more Fibre Channel and IP devices with industry-leading port density and "scale as you grow" flexibility

- Centralizes management of Fibre Channel and IP storage extension traffic while extending Brocade Fabric Vision technology over distance for greater control and insight

- Extends proactive monitoring and alerting between data centers to automatically detect WAN anomalies and simplify troubleshooting of end-to-end IO flows over distance, avoiding unplanned downtime

- Provides load balancing and network resilience with Extension Trunking and Adaptive Rate Limiting to increase WAN utilization and protect against WAN link failures

- Achieves always-on business operations with non-disruptive firmware upgrades and maximizes availability with redundant, hot-pluggable chassis components Controller environment

Purpose-Built Extension Solution for Business Resiliency

Connecting distributed data centers enables data mobility for advanced data protection. Today's IT organizations are under pressure to keep pace with the growing avalanche of data traffic between data centers and the changes driven by virtualized application workloads within Fibre Channel and IP storage environments. Also faced with rising Service Level Agreement (SLA) requirements and recovery expectations, enterprise data centers need their disaster recovery infrastructure to ensure fast, continuous, and easy replication of mission-critical data to anywhere in the world. Storage administrators therefore need to replicate large amounts of data quickly, securely, reliably, and simply while minimizing operational and capital expenses.

To address this challenge, the Brocade® SX6 Extension Blade with Brocade Fabric Vision™ technology, designed for the Brocade X6 Director, provides a Fibre Channel and IP storage replication solution that moves more data over distance faster, delivers security without compromising performance, and scales to support the world's most demanding environments. This solution delivers industry-leading performance, strong security, continuous availability, unmatched flexibility, and simplified operations to handle the unrelenting transfer of data between data centers and to maintain SLAs.

A purpose-built data center extension solution for Fibre Channel and IP storage

environments, the Brocade SX6 blade is designed for high-speed, secure transport of data between data centers while maintaining uptime. This enterprise-class solution enables storage and mainframe administrators to optimize and manage the use of WAN bandwidth, secure data over distance, and minimize the impact of disruptions to help ensure replication objectives are met.

Accelerating Performance over Distance to Meet Recovery Objectives

The Brocade SX6 Extension Blade is an ideal platform for building a high-performance data center extension infrastructure for replication and backup

Synchronous and Asynchronous Replication

IP WAN

Primary
Site

Secondary
Site

Centralized Backup and Archiving
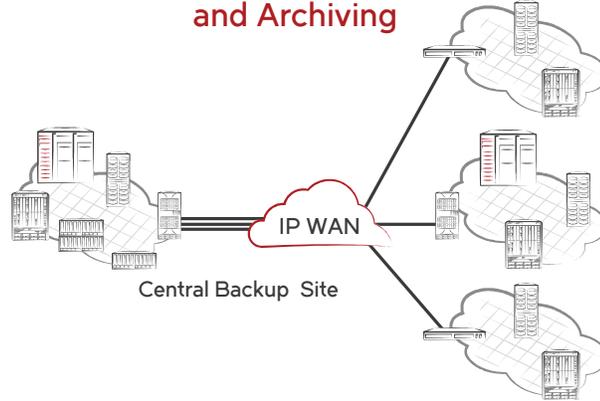
IP WAN

Central Backup Site

Figure 1: The Brocade SX6 Extension Blade provides scalable deployment options to extend Fibre Channel and IP storage replication over long distance for disaster recovery and data protection.

solutions (see Figure 1). It leverages any type of inter-data center WAN transport to extend open systems and mainframe storage applications over any distance. Without the use of extension, those distances are often impossible or impractical.

The advanced performance—up to 80 Gbps per blade—and network optimization features of the Brocade SX6 Extension Blade enable replication and backup applications to move more data over metro and WAN links in less time, and optimize available WAN bandwidth. In addition, the Brocade SX6 secures data flows over distance with no performance penalty to minimize exposure to data breaches between data centers. Supporting up to 250 ms Round-Trip Time (RTT) latency, the Brocade SX6 enables extension over distances up to 37,500 kilometers (23,400 miles).

The Brocade SX6 Extension Blade maximizes utilization of WAN links through protocol optimization technology and expands WAN bandwidth with hardware-based compression, disk and tape protocol acceleration, WAN-optimized TCP, and other extension networking technologies. Advanced features and technologies include:

- **IPsec:** Ensures secure transport over WAN links by encrypting data-in-flight with the hardware-implemented standard 256-bit AES algorithm without a performance penalty or excessive added latency.

- **Unparalleled, extremely efficient architecture:** Uniquely permits the high-speed, low-latency processing of IP datagrams and Fibre Channel/FICON® frames, making extension of synchronous applications possible.

- **WAN-optimized TCP:** Offers an aggressive TCP stack, optimizing TCP window size and flow control, and accelerating TCP transport for high throughput storage applications.

- **Streams:** Is a feature of WAN-optimized TCP and used with Brocade IP Extension to prevent Head-of-Line Blocking (HoLB) across the WAN.

- **PerPriority TCP Quality of Service (PTQ):** Provides high-, medium-, and low-priority handling of Fibre Channel and Brocade IP Extension flows within the same tunnel for transmission over the WAN using autonomous, individual TCP sessions per QoS priority.

- **Extension Trunking:** Combines multiple WAN connections into a single, logical, high-bandwidth trunk, providing active load balancing and network resilience to protect against WAN link failures.

- **Lossless Link Loss (LLL):** Is part of Extension Trunking, providing recovery of data lost in-flight when a link goes offline. From the perspective of the storage applications, nothing ever happened because all data is delivered—and delivered in order.

- **Failover/failback with failover groups:** Circuits are assigned metrics and put in a failover group. If all circuits of the lower metric within the failover group go offline, the higher metric circuits take over. This uses LLL, and all data is delivered and delivered in order. The storage application will not know that a failover/failback has occurred.

- **Adaptive Rate Limiting:** Dynamically adjusts bandwidth sharing between minimum and maximum rate limits to optimize bandwidth utilization and maintain maximum WAN performance during disruptions.

- **Advanced compression architecture:** Provides multiple modes to optimize compression ratios for various throughput requirements.

- **FCIP Fast Write (FCIP-FW):** Accelerates SCSI write processing, maximizing performance of synchronous and asynchronous replication applications across high-latency WAN connections over any distance.

- **Open Systems Tape Pipelining (OSTP):** Accelerates read and write tape processing over distance, significantly reducing backup and recovery times over distance anywhere in the world.

- **Advanced Accelerator for FICON:** Uses advanced networking technologies, data management techniques, and protocol intelligence to accelerate IBM zGlobal Mirror (zGM), mainframe tape read and write operations, and z/OS host connections to Teradata warehousing systems over distance.

Ensuring Continuous Availability between Data Centers

Today's organizations depend on fast, reliable access to data wherever and whenever needed, regardless of location. The ramifications and potential business impact of an unreliable disaster recovery and data protection infrastructure are greater than ever.

The Brocade X6 Director and Brocade SX6 Extension Blade combine data center-proven reliability with an innovative business continuity solution for non-stop operations. They leverage the core technology of Brocade Gen 6 Fibre

Channel, consistently delivering 99.9999 percent uptime in the world's most demanding data centers. The Brocade X6 Director delivers enterprise-class availability features, such as hot-pluggable chassis components with non-disruptive software upgrades to maximize application uptime and minimize outages. This combines director-class availability with Brocade SX6 innovative extension features and the industry's only WAN-side, non-disruptive firmware upgrades to achieve always-on business operations and maximize application uptime. These unique capabilities enable a high-performance and highly reliable network infrastructure for disaster recovery and data protection.

BROCADE SX6 EXTENSION BLADE: DELIVERING BUSINESS RESILIENCY AT SCALE

The Brocade SX6 Extension Blade is a multiprotocol extension solution that securely moves more data over distance faster, while scaling to support the world's most demanding environments. With Brocade Gen 6 Fibre Channel, IP extension capability, and Brocade Fabric Vision technology, this platform delivers industry-leading performance, strong security, continuous availability, high scalability, and simplified operations in a flexible blade design for the Brocade X6 Director. This purpose-built extension solution handles the unrelenting growth of data traffic between data centers in Fibre Channel, FICON, and IP storage environments.

The Brocade SX6 provides a suite of features—from pre-deployment validation to advanced network failure recovery technologies—to ensure a continuously available storage extension infrastructure. With built-in Flow Generator and WAN Test Tool (Wtool), administrators can validate conditions of the WAN links,

network paths, and proper setup of configurations prior to deployment. In addition, administrators can troubleshoot the physical infrastructure to ease deployment and avoid potential issues.

To protect against WAN link failure and avoid restart or resync events, the Brocade SX6 Extension Blade leverages Brocade WAN-optimized TCP to ensure in-order lossless transmission of data. In addition, the Brocade SX6 with Extension Trunking protects against WAN link failures with tunnel redundancy for lossless path failover and guaranteed in-order data delivery using LLL. The advanced Extension Trunking feature allows multiple network paths to be used simultaneously. When there is a failure for a network path, Extension Trunking will automatically retransmit the lost packets over a non-affected WAN link to maintain overall data integrity. The replication application will be protected and continue with no disruption.

To maintain replication application performance during failure situations, the Brocade SX6 features Adaptive Rate Limiting that uses dynamic bandwidth sharing between minimum (floor) and maximum (ceiling) rate limits. With Adaptive Rate Limiting, organizations can optimize bandwidth utilization and maintain full WAN performance of the link during periods when a path is offline due to an extension platform, IP network device, or array controller outage. During this failure scenario, the other extension switch automatically detects that the first device went idle, and dynamically adjusts to utilize 100 percent of the available WAN bandwidth, providing full throughput. In addition, with unprecedented amounts of storage data crossing extension connections and consuming larger, faster links, Brocade has enhanced Adaptive Rate Limiting to react 10 times faster to varying traffic patterns that compete for WAN bandwidth or use shared interfaces.

Brocade extends proactive monitoring between data centers through MAPS and Flow Vision to automatically detect WAN anomalies. With real-time information, administrators can pinpoint and isolate the issue to either its storage or network device to accelerate troubleshooting and avoid unplanned downtime.

Flexible and Scalable Multiprotocol Connectivity Solution for Disaster Recovery

The Brocade SX6 Extension Blade provides flexible Fibre Channel and IP storage replication deployment options within the Brocade X6 Director, integrating seamlessly with Fibre Channel blades or providing standalone extension services for large-scale, multi-site data center environments implementing block, file, and tape data protection solutions. In addition, a broad range of advanced extension, FICON, and storage fabric services are available to address the most challenging extension and storage networking requirements. The Brocade SX6 is ideal for:

- Data protection for open systems and mainframe

- Multi-site synchronous and asynchronous storage replication

- Centralized tape backup, recovery, and archiving

- Consolidation of Fibre Channel, FICON, and IP storage data flows from heterogeneous arrays

With the Brocade SX6, organizations gain "scale as you grow" flexibility with up to four blades within a Brocade X6 Director chassis. Each extension blade provides 16 32 Gbps Fibre Channel/FICON ports, 16 1/10 Gigabit Ethernet (GbE) ports, and 2 40 GbE ports to deliver the high bandwidth, port density, and throughput required for maximum application performance over WAN connections. With industry-leading port density, administrators can connect more Fibre Channel and IP storage devices to scale on demand.

To meet current and future requirements, with compression enabled, organizations can scale up to 80 Gbps application throughput, depending on the type of data and the characteristics of the WAN connection.

The Brocade SX6 Extension Blade provides a comprehensive bundle that includes an unlimited WAN rate up to 40 Gbps and a set of advanced services: FCIP, IP Extension, Brocade Fabric Vision technology, Extension Trunking, Adaptive Rate Limiting, IPsec, compression, Open Systems Tape Pipelining (OSTP), Fast Write, Adaptive Networking, Extended Fabrics, FICON Management Server (CUP), and Advanced FICON Acceleration. An optional value-add license for Integrated Routing (FCR) is available to address challenging extension and storage networking requirements in open systems environments.

Organizations can deploy the Brocade SX6 and the Brocade 7840 Extension

Switch in a data center-to-edge architecture as a cost-effective option for connecting primary data centers with remote data centers and offices.

Enhancing IP Storage Replication Local Performance over Long Distance

IP storage arrays with native replication applications are not built to efficiently handle latency and packet loss. The Brocade SX6 provides a robust IP extension solution that delivers local performance at long distance—along with strong encryption—for comprehensive disaster recovery. It leverages Brocade TCP Acceleration to help achieve the fastest replication speeds possible from IP storage devices, and Brocade WAN-optimized TCP to ensure in-order lossless transmission of IP extension data.

Brocade IP extension solutions help to significantly increase the performance of IP storage applications across the WAN—even with encryption turned on. The more latency and packet loss between the data centers, the greater the gain. The Brocade SX6 can move 50 times more data than native TCP/IP stacks to meet rigorous recovery objectives. Such performance gains enable use cases that at one time were deemed unfeasible.

IP extension also offers other, more far-reaching benefits. With multiprotocol port connectivity, organizations can consolidate IP replication flows, or both IP storage and Fibre Channel/FICON flows, within a single blade, enabling storage

administrators to consolidate IO flows from heterogeneous devices and multiple protocols. The consolidation of these applications into a single, managed tunnel between data centers across the WAN has real operational, availability, security, and performance value.

IP extension supports a range of commonly used storage applications, such as array native IP Remote Data Replication (RDR), IP-based centralized backup, VM replication, host-based and database replication over IP, NAS head replication between data centers, and data migration between data centers.

Simplify Management over Distance for Greater Control and Insight

Extending Brocade Fabric Vision technology between data centers provides unprecedented insight and visibility across the storage network. With its powerful integrated monitoring, management, and diagnostic tools, Fabric Vision technology enables organizations to minimize the impact of disruptions and outages for non-stop business operations. Consolidating Fibre Channel/FICON flows and IP storage flows into a single tunnel contributes significantly to operational excellence. And by using custom, browser-accessible dashboards for combined Fibre Channel and IP storage, storage administrators have a centralized management tool to monitor the health and performance of their networks.

The Brocade SX6 Extension Blade supports the following Fabric Vision technology features for storage extension management:

• **Monitoring and Alerting Policy Suite (MAPS):** Provides a prebuilt, policy-based threshold monitoring and alerting tool that proactively monitors storage extension network health based on a comprehensive set of metrics at tunnel, circuit, and QoS (tunnel and circuit) layers. Administrators can configure multiple fabrics at one time using predefined or customized rules and policies for specific ports or switch elements.

• **Fabric Performance Impact (FPI) Monitoring:** Uses predefined thresholds and alerts in conjunction with MAPS to automatically detect and alert administrators to severe levels or transient spikes of latency, and to identify 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. This feature also provides automatic mitigation or recovery from the effects of slow drain devices.

• **Dashboards:** Provides integrated dashboards that display overall SAN and IP extension health, along with details on out-of-range conditions, and configuration drift to 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 scale the configuration across the fabric. In addition, they can ensure 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 Fibre Channel optics and cables, simplifying deployment and support of high-performance fabrics. ClearLink Diagnostic Port (D_Port) is an advanced capability of 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 Learning:** Enables administrators to non-disruptively discover all flows that go to or come from a specific host port or a storage port, or traverse ISLs/IFLs or FCIP tunnels to monitor fabric-wide application performance. In addition, administrators can discover top and bottom bandwidth-consuming devices and manage capacity planning.

– **Flow Monitor:** Provides comprehensive visibility into flows across a storage extension network, including the ability to automatically learn flows and non-disruptively monitor flow performance. Administrators can monitor all flows from a specific storage device that are writing to or reading from a destination storage device/LUNs, or across a storage extension network. 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 pretesting and validating storage extension infrastructure—including route verification, QoS zone setup, extension trunking configuration, WAN access, IPsec policy setting, and integrity of optics, cables, and ports—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 storage networking management and helps organizations dramatically reduce deployment and configuration times by allowing fabrics, switches, and ports to be managed as groups. Consolidated dashboard views across Fibre Channel and IP storage are available out of the box, so teams can immediately start monitoring their storage network resources. Customizable dashboards graphically display performance and health indicators, including all data captured using Brocade Fabric Vision technology. To accelerate troubleshooting, administrators can use dashboard playback to quickly review past events and to identify problems in the fabric. Dashboards and reports also can be configured to show only the most relevant data, enabling administrators to more efficiently prioritize their actions and maintain network performance.

Brocade Network Advisor provides organizations with a programmable Web-based interface through a standard REST API to reduce operational tasks by automating zoning, scripting, and reporting. To further simplify management tasks, administrators can quickly search through events, historical data, base inventory, and apply filters. In addition, standard REST APIs leverage Brocade Fabric Vision technology to gain fabric-wide health and performance visibility within easy-to-read dashboards.

Integrated Architecture and Management

The Brocade SX6 utilizes the same Brocade Fabric OS® that supports the entire Brocade storage networking product family with Gen 6 Fibre Channel. This helps ensure seamless interoperability with advanced features such as Brocade Fabric Vision technology, Brocade Integrated Routing, and Brocade Extension Trunking.

In addition, organizations can perform management and administrative tasks through familiar Brocade management tools, including Brocade Network Advisor, Brocade Web Tools, and the Command Line Interface (CLI). Moreover, optional FICON Control Unit Port (CUP) capabilities enable legacy management applications to seamlessly support Brocade FICON environments.

Brocade Global Services

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 20 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, and education services, 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 SX6 Extension Blade Specifications

System Architecture

Fibre Channel ports	16 32 Gbps ports; E, F, EX, D, and AE ports
Ethernet ports	16 1/10 GbE ports and two 40 GbE ports
Scalability	Full-fabric architecture with 239 switches maximum
Certified maximum	Single fabric: 56 domains, 7 hops Multiprotocol routing fabric: 19 hops
Fibre Channel performance	**Fibre Channel:** 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; 28.05 Gbps, full duplex; auto-sensing of 4, 8,16, 32 Gbps port speeds; 10 Gbps optionally programmable to fixed port speed
System scalability	Up to four Brocade SX6 blades per Brocade X6 Director family chassis
ISL Trunking	Up to eight 32 Gbps ports per ISL trunk; up to 256 Gbps bandwidth per ISL trunk
Fabric latency	700 ns with no contention, cut-through routing at 32 Gbps
Maximum Fibre Channel frame size	2,112-byte payload
Maximum IP MTU size	Jumbo frames at 9,216 bytes
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	F_Port, E_Port, EX_Port, D_Port, and AE_Port. For FCIP, VE_Port (Virtual E_Port).
Data traffic types	Fabric switches supporting unicast
Media types	**Fibre Channel:** Brocade hot-pluggable Small Form Factor (SFP) and SFP+, short wavelength (SWL), long wavelength (LWL), and extended long wavelength (ELWL) transceivers (available wavelength options vary for 16 Gbps and 32 Gbps SFPs) **Ethernet:** Brocade hot-pluggable Small Form Factor (SFP) and SFP+, short reach wavelength (SRWL), long reach wavelength (LRWL), extended long wavelength (ELWL), and copper SFP/SFP+ transceivers (available reach options vary from 1 GbE, 10 GbE, and 40 GbE)
Fabric services	Monitoring and Alerting Policy Suite (MAPS); Flow Vision; Brocade Adaptive Networking (Ingress Rate Limiting, Traffic Isolation, QoS); Fabric Performance Impact (FPI) Monitoring; Slow Drain Device Quarantine (SDDQ); Brocade Advanced Zoning (default zoning, port/WWN zoning, broadcast zoning, peer zoning, target driven 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; Configuration and Operational Monitoring Policy Automation Services Suite (COMPASS); NPIV; Time Server; Registered State Change Notification (RSCN); Reliable Commit Service (RCS); Simple Name Server (SNS); Virtual Fabrics (Logical Switch, Logical Fabric); Read Diagnostics Parameter (RDP)

Management

Supported management software	HTTP, SNMP v1/v3 (FE MIB, FC Management MIB), SSH; Auditing, Syslog; NTP v3; Brocade Advanced Web Tools; Brocade Network Advisor SAN Enterprise or Brocade Network Advisor SAN Professional/Professional Plus; Command Line Interface (CLI); SMI-S compliant; REST API;
Security	AES-GCM-256 encryption on ISLs, AES-GCM-256 IPsec encryption on virtual ISLs (VE_Port), DH-CHAP (between switches and end devices), FCAP switch authentication; FIPS 140-2 L2-compliant, HTTPS, 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
Diagnostics	POST and embedded online/offline diagnostics, including ClearLink D_Port, FCIP ping, FCIP traceroute, FCping, Pathinfo (FCtraceroute), Wtool, and Ftrace

Brocade SX6 Extension Blade Specifications *(continued)*

Mechanical

Size	Width: 420.6 mm Height: 36.3 mm Depth: 289.8 mm Occupies one slot in a Brocade X6 Director family chassis
System weight	11.5 lb without SFP/SFP+

Environmental

Temperature	Operating: 0°C to 40°C (32°F to 104°F) Non-operating: –25°C to 70°C (–13°F to 158°F)
Humidity	Operating: 10% to 85% (non-condensing) Non-operating: 10% to 90% (non-condensing)
Altitude	Operating: Up to 3,000 m (9,842 ft) Storage: Up to 12 km (39,370 ft)
Shock	Operating: 20 g, 6 ms, half-sine Non-operating: 33 g, 11 ms, half-sine, 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

Power

Maximum power	425 watts

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

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

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

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