FAQ

Brocade Storage Extension Solutions Frequently Asked Questions

Introduction

Brocade® extension switches and extension blades for Brocade director families are purpose-built, best-in-class extension platforms that provide a fast, highly reliable, and cost-effective network infrastructure to address today's most demanding disaster recovery requirements. They enable organizations to improve resilience and maximize throughput for replication and backup operations over distance. These extension solutions also increase visibility into storage extension network health and the performance of data protection applications.

For product information, visit:

Extension Switches:

- Brocade 7840 Extension Switch: http://www.brocade.com/7840
- Brocade 7800 Extension Switch: http://www.brocade.com/7800

Extension Blades:

- Brocade SX6 Extension Blade: http://www.brocade.com/sx6
- Brocade FX8-24 Extension Blade: http://www.brocade.com/fx8-24

General Questions and Answers

Q. What extension solutions does Brocade offer?

A. To address disaster recovery requirements, Brocade offers a full extension solutions portfolio designed to give organizations flexible deployment options for replication. The Brocade 7840 and 7800 Extension Switches are designed for small to large enterprise environments. The Brocade SX6 and FX8-24 Extension Blades are integrated blade options for the Brocade X6 Director and Brocade DCX® 8510 Backbone families, and are designed for high-density, large enterprise environments.

Q. What is the Brocade 7840 Extension Switch?

A. The Brocade 7840 Extension Switch is a purpose-built extension solution that moves more data over distance faster while minimizing the impact of disruptions. With Gen 5 Fibre Channel, IP extension capability, and Brocade Fabric Vision™ technology, this switch delivers industry-leading performance, strong security, continuous availability, and simplified management to handle the unrelenting growth of data traffic between data centers. The Brocade 7840 accelerates performance over distance with up to

80 Gbps of FCIP throughput and up to 40 Gbps of IP extension throughput to meet stringent disaster recovery objectives. Twenty-four 16 Gbps Fibre Channel ports, sixteen 1/10 Gigabit Ethernet (GbE) ports, and two 40 GbE ports provide the bandwidth, port density, and throughput required for maximum application performance over WAN links for large, complex environments. Designed for maximum flexibility, this enterprise-class extension switch offers "pay as you grow" scalability with capacity on-demand upgrades. Organizations can quickly and cost-effectively scale from 20 Gbps to 80 Gbps application throughput per platform via software licenses to meet current and future requirements.

The Brocade 7840 base configuration is a bundle that includes a comprehensive set of advanced services: FCIP, IP Extension, Enterprise Bundle, Brocade Fabric Vision technology, Extension Trunking, WAN-optimized TCP, Adaptive Rate Limiting, IPsec, Compression, Open Systems Tape Pipelining (OSTP), Fast Write, Adaptive Networking, and Extended Fabrics. Optional value-add licenses for Integrated Routing (FCR), FICON® CUP, and Brocade Advanced FICON Accelerator are available to address challenging extension and storage networking requirements in open system and mainframe environments.

Q. What is the Brocade 7800 Extension Switch?

A. The Brocade 7800 is a rack-based solution that combines best-in-class Fibre Channel, FICON, and FCIP performance, "pay as you grow" scalability, and flexible deployment options for data centers and remote offices. Up to sixteen 8 Gbps Fibre Channel ports and six 1 GbE ports provide scalable bandwidth, port density, and throughput, extending and optimizing fabric connectivity over distance to support disaster recovery applications. Aggregate bandwidth of up to 128 Gbps for non-blocking Fibre Channel switching and up to 5 Gbps for FCIP provides class-leading performance and throughput. Dual redundant, hot-swappable power supplies with integrated fans maximize availability and minimize outages. In addition, the Brocade 7800 integrates seamlessly with the Brocade FX8-24, providing larger enterprises with a cost-effective solution to connect remote offices to a primary data center. Note: The Brocade 7800 Extension Switch and the Brocade FX8-24 Extension Blade are not interoperable with the Brocade 7840 Extension Switch.

Two models of the Brocade 7800 are available to address a variety of capacity, functionality, and cost objectives:

- The Brocade 7800 16/6 with sixteen 8 Gbps Fibre Channel ports and six 1 GbE ports maximizes connectivity for multi-site and point-to-point open systems disk and tape replication, as well as mainframe disk and tape applications over distance (Advanced FICON Accelerator).
- The Brocade 7800 4/2 with four 8 Gbps Fibre Channel ports and two 1 GbE ports provides cost-effective connectivity for two sites or point-to-point open systems disk replication (OSTP is not available on the 4/2 model), as well as mainframe disk and tape applications over distance (Advanced FICON Accelerator).

Q. What is the Brocade SX6 Extension Blade?

A. The Brocade SX6 Extension Blade is a Fibre Channel and IP storage replication solution for the Brocade X6 Director family that moves more data over distance faster, delivers security without compromising performance, and scales to support the world's most demanding environments. This blade provides the Brocade X6 Director with integrated metro and global connectivity for Fibre Channel and IP storage environments. With Gen 6 Fibre Channel, IP extension capability, and Brocade Fabric Vision technology, 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. This enables storage and mainframe administrators to optimize and manage the use of WAN bandwidth, secure data over distance, minimize the impact of disruptions, and maintain SLAs.

The Brocade SX6 blade accelerates performance over distance with up to 80 Gbps of FCIP throughput and up to 40 Gbps of IP extension throughput to meet stringent disaster recovery objectives. The Brocade X6 Director can scale up to four Brocade SX6 blades per chassis. Each Brocade SX6 Extension Blade provides 16 32 Gbps Fibre Channel/FICON ports, 16 1/10 Gigabit Ethernet (GbE) ports, and 2 40 GbE ports, delivering the high bandwidth, port density, and throughput required for maximum application performance over WAN connections—and to meet the most demanding disaster recovery requirements.

The Brocade SX6 blade includes a comprehensive set of advanced services: FCIP, IP Extension, Enterprise Bundle, Brocade Fabric Vision technology, Extension Trunking, WAN-optimized TCP, Adaptive Rate Limiting, IPsec, Compression, Open Systems Tape Pipelining (OSTP), Fast Write, Adaptive Networking, Extended Fabrics, FICON CUP, and Brocade Advanced FICON Accelerator. An optional value-add license for Integrated Routing (FCR) is available to address challenging extension and storage networking requirements in open systems environments.

Q. What is the Brocade FX8-24 Extension Blade?

A. The Brocade FX8-24, a blade-based solution designed for the Brocade DCX 8510 with Gen 5 Fibre Channel (16 Gbps), provides enterprise-class Fibre Channel and FCIP performance, availability, and security for primary and secondary data centers. Aggregate bandwidth of 96 Gbps for Fibre Channel switching and up to 20 Gbps for FCIP provide industry-leading performance and throughput for open systems and mainframe storage applications. Two optional 10 GbE ports, providing 10 Gbps FCIP connectivity, maximize available FCIP bandwidth and enable consolidation of 1 GbE ports. Up to four Brocade FX8-24 blades can be installed in a Brocade DCX 8510 chassis for simple expansion and enterprise data center reliability.

Q. Do Brocade extension products support Brocade Fabric Vision technology? What are the benefits?

A. Brocade Fabric Vision technology is supported on Brocade extension products. 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 replication 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.

Brocade extension products support many Fabric Vision technology features for storage extension. See Table 1A and 1B for details.

Table 1A: Fabric Vision technology support by feature and product.

Feature	Brocade SX6 Extension Blade	Brocade 7840 Extension Switch	Brocade 7800 Extension Switch and Brocade FX8-24 Extension Blade
MAPS	Yes	Yes	Yes
Fabric Performance Impact (FPI) Monitoring	Yes*	Yes*	Yes
Dashboards	Yes	Yes	Yes
Flow Learning	Yes	Yes	No
Flow Monitoring	Yes*	Yes*	Yes, with some limitations
Flow Mirroring	Yes*	Yes*	No
Flow Generator	Yes*	Yes*	No
COMPASS	Yes	Yes	Yes
Forward Error Correction	Yes*	Yes*	No
Credit Loss Recovery	Yes*	Yes*	No
Brocade ClearLink Diagnostics (D_Port)	Yes*	Yes*	No

*Note: Unavailable on IP Extension at this time.

Table 1B: Detailed Fabric Vision technology features supported by Brocade extension products.

	Brocade 7800 Brocade FX8-24	Brocade 7840 Brocade SX6
Flow Generator	Pass (including passing through VE_Port) and receive, but does not generate Flow Generator traffic	Generate, pass (including passing through VE_Port), and receive Flow Generator traffic
MAPS	**Per circuit:** Throughput, packet loss, and state change (circuit fencing is supported for state change)	**Per tunnel/VE:** Throughput, state change (VE fencing is supported for state change) **Per circuit:** RTT, jitter, throughput, packet loss, state change (circuit fencing is supported for state change) **Per QoS (at tunnel level):** Throughput, packet loss, RTT, jitter
Flow Monitor	Report IOPS and throughput per (SID, DID, LUN, SCSIRead/Write) flow (monitored on F/E_Port, LUN level; supported on F_Port only)	Report IOPS and throughput per (SID, DID, LUN, SCSIRead/Write) flow (monitored on F/E_Port; LUN-level supported on F_Port only)
Brocade Network Advisor FCIP SAN Extension Widget	Yes	Yes

Q. What features and capabilities does Brocade Fabric Vision technology offer?

A. 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 features for storage extension management include (dependent on device outline above):

- **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 identifies slow drain devices that might impact the network. 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.

For more information on Fabric Vision technology, visit: www.brocade.com/fabricvision.

Q. What are the key platform features of the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24?

A. The Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 maximize replication and backup throughput over distance using advanced compression, disk and tape protocol acceleration for open systems and mainframe environments, and extension networking technology. Advanced features and technologies include:

- **Extension Trunking:** Creates logical tunnels spanning multiple physical ports for load balancing and network failure resiliency.
- **IPsec support:** Ensures secure transport over IP WAN links by encrypting data-in-flight with a standard 256-bit AES algorithm.
- **Unparalleled, extremely efficient architecture:** Uniquely permits the high-speed, low-latency processing of frames, making extension of synchronous applications possible.
- **Adaptive Rate Limiting:** Dynamically adjusts bandwidth limits to ensure efficient utilization and sharing of available bandwidth.
- **Advanced compression architecture:** Provides multiple modes to optimize compression ratios for various throughput requirements.
- **WAN-optimized TCP:** Optimizes TCP window size, flow control, fast retransmits, and slow starts, resulting in an accelerated TCP transport for storage applications.
- **Fast Write (FCIP-FW):** Accelerates SCSI write processing, enabling asynchronous disk replication over any distance.
- Open Systems Tape Pipelining**:** Accelerates read and write tape processing, minimizing backup and restore windows.
- **Brocade Advanced Accelerator for FICON:** Accelerates IBM z/OS Global Mirror (zGM, formerly known as eXtended Remote Copy, or XRC), mainframe tape read and write operations, and z/OS host connection to Teradata warehousing systems, maximizing performance over distance.
- **PerPriority TCP Quality of Service (PTQ):** Prioritizes flows within an FCIP tunnel to optimize bandwidth and performance by application with individual TCP sessions per QoS priority. There are three priorities for Brocade IP Extension flows and three separate priorities for FCIP flows.
- **Seamless interoperability with Brocade SAN switches and Brocade Network Advisor:** Simplifies deployment and administration.

Q. What are the use cases for Brocade extension solutions?

A. Brocade extension solutions leverage cost-effective and sophisticated IP WAN transport to deploy high-performance disaster recovery and data protection solutions. They extend open systems and mainframe storage applications over distances that would otherwise be impossible, impractical, or too expensive with standard connections.

Both the Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade are robust platforms for large-scale, multi-site data center environments implementing block, file, and tape data protection solutions. These solutions are unique in their ability to do FCIP and IP extension and are ideal for:

- Data protection for both open systems and mainframe
- Multi-site synchronous and asynchronous storage replication
- Accelerating IP storage across the WAN
- Operational excellence with converged bandwidth management of IP storage and FCIP across the WAN (includes MAPS and diagnostic tools)
- Enhancing the availability of FCIP and IP using Extension Trunking across multiple IP network paths
- Securing IP storage, Fibre Channel, and FICON data-in-flight across the WAN
- Centralized tape backup, recovery, and archiving for NAS, Fibre Channel, FICON, and IP-based backups
- Consolidation of replication IO from heterogeneous arrays and multiple protocols

Q. Are the Brocade extension switches and blades compatible with each other?

A. The Brocade 7840 Extension Switch and Brocade SX6 Extension Blade do not support connectivity with the Brocade 7800 and Brocade FX8-24. However, the Brocade 7840 and Brocade SX6 on Brocade FOS 8.0.1 and above can be connected seamlessly via FCIP tunnels over WAN links, providing flexible deployment options to address scalability, performance, and cost requirements for multi-site extension. The Brocade 7840 and Brocade SX6 only connect via FCIP/IP extension to other Brocade 7840 switches and Brocade SX6 blades.

The Brocade 7800 and Brocade FX8-24 can also be connected seamlessly via FCIP tunnels over WAN links, providing flexible deployment options to address scalability, performance, and cost requirements for multi-site extension.

Q. Do the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 interoperate with other Brocade Fabric OS switches?

A. Yes. The Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 all utilize the same Brocade Fabric OS® (FOS) that supports the entire Brocade storage networking product family. This helps ensure seamless interoperability with advanced features such as Brocade Fabric Vision technology, Brocade Integrated Routing, and Brocade Extension Trunking.

Although the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 are compatible with current and previous generation Fibre Channel switches, the Brocade 7840 and Brocade SX6 do not support extension connections to the Brocade 7800 and Brocade FX8-24. The Brocade 7840 and Brocade SX6 can only connect to other Brocade 7840 and Brocade SX6 extension devices.

Q. Are extension implementation services available through Brocade Professional Services?

A. Yes. Extension implementation services are available. As part of this service, a Brocade expert will assess the network and application environment, provide an estimated throughput of the extension link, and verify that requirements align with the available capabilities and resources. Brocade will then implement the specific configuration for connections between fabrics.

Q. Who sells Brocade extension products?

A. Brocade extension solutions are available through traditional OEMs as well as VAD/VAR channels.

Product Details

Q. What are the key differences between Brocade switches and blades?

A. The Brocade 7840 and 7800 are switch form-factor extension products; the Brocade SX6 and Brocade FX8-24 are blade form-factor extension products for the Brocade director families. The Brocade 7840 requires Brocade FOS 7.3.0 or later, and the Brocade SX6 requires Brocade FOS 8.0.1 or later.

The Brocade 7840 and Brocade SX6 provide the following additional features:

- Unified support and management of both Fibre Channel/FICON and IP storage
- Extension Hot Code Load (eHCL), providing non-disruptive firmware upgrade support
- Fabric Vision technology features, such as Flow Generator support
- Increased maximum extension trunk bandwidth (VE_Port) to 20 Gbps (from 10 Gbps)
- Enhanced Adaptive Rate Limiting, which supports a ramp-up time that is 10 times faster and provides three transmission rate-reduction behavior options based on WAN Round-Trip Time (RTT) and application sensitivity to latency (auto-mode recommended)
- Support for jumbo frames up to 9,216 bytes (IP MTU)
- Automatic path MTU discovery (PMTU)
- IPsec for IPv6
- WAN Test Tool (Wtool), which replaces Tperf on the Brocade 7800 and Brocade FX8-24

The following tables provide detailed hardware and feature comparisons of Brocade switches and blades.

Table 2: Brocade extension product comparison.

Standard Features	Brocade SX6	Brocade 7840	Brocade FX8-24	Brocade 7800 16/6	Brocade 7800 4/2
Form factor	Blade	Switch	Blade	Switch	Switch
Fibre Channel/FICON ports	16 (32 Gbps)	24 (16 Gbps)	12 (8 Gbps)	16 (8 Gbps)	4 (8 Gbps)
1/10 GbE ports	16×1/10 GbE	16×1/10 GbE	10×1 GbE + 2×10 GbE	6×1 GbE	2×1 GbE
40 GbE ports	2	2	N/A	N/A	N/A
Maximum Fibre Channel/FICON throughput	80 Gbps	20 Gbps upgradable to 80 Gbps	20 Gbps upgradable to 40 Gbps	12 Gbps	6 Gbps
Maximum FCIP bandwidth (FCIP mode)	80 Gbps at 2:1 cmp (40 Gbps per DP)	80 Gbps at 2:1 cmp (40 Gbps per DP)	20 Gbps	6 Gbps	2 Gbps
Maximum FCIP bandwidth (hybrid mode)	40 Gbps at 2:1 cmp (20 Gbps per DP)	40 Gbps at 2:1 cmp (20 Gbps per DP)	N/A	N/A	N/A

Standard Features	Brocade SX6	Brocade 7840	Brocade FX8-24	Brocade 7800 16/6	Brocade 7800 4/2
Maximum IP extension bandwidth (hybrid mode)	40 Gbps (20 Gbps per DP)	40 Gbps (20 Gbps per DP)	N/A	N/A	N/A
Maximum bandwidth per VE_Port	20 Gbps	20 Gbps	10 Gbps	6 Gbps with optional FCIP Trunking	2 Gbps with optional FCIP Trunking
Maximum number of VE_Ports	10 default (20 Gbps max VE bandwidth) 20 (10 Gbps max VE bandwidth)	10 default (20 Gbps max VE bandwidth) 20 (10 Gbps max VE bandwidth)	20	8	2
High-throughput compression (Fibre Channel/FICON ingress, Note: IP extension is limited to Deflate and Aggressive Deflate)	Fast Deflate: 80 Gbps Deflate: 32 Gbps Aggressive Deflate: 20 Gbps	Fast Deflate: 80 Gbps Deflate: 32 Gbps Aggressive Deflate: 20 Gbps	Standard: 40 Gbps Moderate: 16 Gbps Aggressive: 5 Gbps	Standard: 12 Gbps Moderate: 8 Gbps Aggressive: 2.5 Gbps	Standard: 4 Gbps Moderate: 4 Gbps Aggressive: 2.5 Gbps
Non-disruptive firmware upgrade	Fibre Channel and IP	Fibre Channel and IP	Fibre Channel only	Fibre Channel only	Fibre Channel only
Integrated Routing (FCR)	Optional	Optional	Optional	Optional	Optional
IPsec (AES 256)	Included	Included	Included	Included	Included
FIPS	Included	Included	N/A	N/A	N/A
Fast Write (FCIP-FW)	Included	Included	Included	Included	Included
Open Systems Tape Pipelining (OSTP)	Included	Included	Included	Included	Requires upgrade to Brocade 7800 16/6
Storage-optimized TCP	Included	Included	Included	Included	Included
Quality of Service (PTQ, DSCP, 802.1P)	Included	Included	Included	Included	Included
Extension Trunking	Included	Included	Optional	Optional	Optional
Adaptive Rate Limiting	Included	Included	Optional	Optional	Optional
Advanced Accelerator for FICON	Included	Optional	Optional	Optional	Optional
FICON CUP	Included	Optional	Optional	Optional	Optional
MAPS	Included (tunnel, circuit and QoS levels)	Included (tunnel, circuit and QoS levels)	Optional (circuit level only)	Optional (circuit level only)	Optional (circuit level only)
Flow Monitor	Included	Included	Optional	Optional	Optional
Flow Generator	Included	Included	Not supported	Not supported	Not supported
Tperf/WAN Test Tool (Wtool)	Wtool	Wtool	Tperf	Tperf	Tperf

Q. What are the key differences between the Brocade 7800 16/6 and Brocade 7800 4/2?

A. Both models of the Brocade 7800 leverage the same hardware and software platform. The Brocade 7800 16/6 Extension Switch is a robust platform for data centers and multi-site environments that are implementing disk and tape solutions for open systems and mainframe environments. The Brocade 7800 4/2 offers lower port density, select advanced features, and a lower price point—making it a cost-effective option for smaller data centers and remote offices that are implementing point-to-point open systems disk replication or mainframe zGM, tape, or Teradata warehousing applications. It does not include support for Open Systems Tape Pipelining. The Brocade 7800 4/2 can be easily upgraded to the Brocade 7800 16/6 through software licensing, providing scalability and investment protection for growing environments.

Q. What optional extension features are available for the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24?

A. A broad range of optional advanced extension, SAN fabric, and FICON services are available to address the most challenging extension and storage networking requirements in open systems and mainframe environments.

The Brocade 7840 Extension Switch includes:

- Enterprise Bundle
- Brocade Fabric Vision technology
- Advanced Extension License (Extension Trunking and Adaptive Rate Limiting)
- 10 GbE license (all 10 GbE interfaces are enabled)

The Brocade SX6 Extension Blade includes:

- Enterprise Bundle
- Brocade Fabric Vision technology
- Advanced Extension License (Extension Trunking and Adaptive Rate Limiting)
- 10 GbE license (all 10 GbE interfaces are enabled)
- Unlimited WAN rate (up to 40 Gbps)
- Advanced Accelerator for FICON
- FICON Management Server Control Unit Port (CUP)

Optional licenses include:

- **Integrated Routing (FCR) license for all extension products:** There are no VEX_Ports on the Brocade 7840 and Brocade SX6. This license enables EX_Ports for Fibre Channel Routing (FCR).
- **Brocade 7840 optional upgrades:** Enables "pay as you grow" scalability with capacity on-demand upgrades:
  - **Brocade 7840 Medium Configuration (Base + WAN rate upgrade #1):** Enables 10 Gbps WAN rate.
  - **Brocade 7840 Maximum Configuration (Base + WAN rate upgrades #1 and #2):** Enables two 40 GbE ports, unlimited WAN rate (up to 40 Gbps).
- **Brocade 7800 4/2 Upgrade:** Enables all ports and Open Systems Tape Pipelining.
- **Brocade FX8-24 10 GbE Port Upgrade:** Enables the two 10 GbE ports and optional 10 GbE port configurations.

Optional FICON services are available for the Brocade 7840, Brocade 7800, and Brocade FX8-24. These services address challenging extension and storage networking requirements in mainframe environments. They include:

- **Advanced Accelerator for FICON:** Enables high-performance FICON tape, zGM, and z/OS host connection to Teradata warehousing systems over distance.
- **FICON Management Server:** Control Unit Port (CUP) enables host control of switches in mainframe environments.

Optional advanced extension and SAN fabric services for the Brocade 7800 and Brocade FX8-24 include:

- **Advanced Extension:** Enables Extension Trunking and Adaptive Rate Limiting.
- **Optional Brocade Fabric OS advanced fabric services:** Enterprise Bundle, Brocade Integrated Routing (FCR), Brocade Fabric Vision, Brocade Extended Fabrics, and Brocade Extension Trunking.

Q. What is required to enable the 40 GbE ports on the Brocade 7840 and Brocade SX6?

A. There is no license required to enable the 40 GbE ports on the Brocade SX6 blade. However, both WAN upgrade optional licenses are needed for the Brocade 7840 Extension Switch to enable the 40 GbE ports.

Q. What is required to enable the 10 GbE ports on the Brocade FX8-24?

A. The optional 10 GbE ports are easily activated on a per-blade basis through a simple license upgrade to maximize FCIP bandwidth. Activating the 10 GbE ports on each blade doubles the aggregate bandwidth to a maximum of 20 Gbps and enables additional FCIP port configurations (ten 1 GbE ports and one 10 GbE port, or two 10 GbE ports).

Q. What benefits will the new Brocade FX8-24 hardware SKU provide?

A. Brocade introduced a new Brocade FX8-24 hardware SKU to provide higher platform IPsec throughput. The new Brocade FX8-24 provides 20 Gbps IPsec throughput compared with 10 Gbps IPsec throughput on the original Brocade FX8-24 hardware SKU. No new license is required to enable higher IPsec throughput on the new Brocade FX8-24 hardware SKU. However, Brocade FOS 7.1 is required to enable the higher IPsec throughput. The new Brocade FX8-24 hardware SKU supports all previous Brocade FOS releases that support the current Brocade FX8-24 hardware SKU. When running any previous Brocade FOS release, the new Brocade FX8-24 hardware SKU is no different than the original Brocade FX8-24 hardware SKU in terms of functionality.

Q. What is required to upgrade the Brocade 7800 4/2 to the functionality of the Brocade 7800 16/6?

A. The Brocade 7800 4/2 can be easily upgraded with a simple license upgrade to increase bandwidth and functionality. The upgrade license activates 12 additional Fibre Channel ports, four additional 1 GbE ports, six additional VE_Ports, and Open Systems Tape Pipelining.

Q. Are Brocade optics required for the new switches?

A. Yes. The Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 require Brocade-branded Small Form-Factor Pluggable (SFP) and Quad Small Form-Factor Pluggable (QSFP) optics.

Q. Does Brocade offer a choice of SFPs?

A. Yes. The Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 can use a variety of Brocade hot-pluggable SFP and SFP+ transceivers to support distance, xWDM, cable type, and port-speed requirements.

Q. Is there a minimum version of Brocade FOS required for the Brocade SX6 Extension Blade?

A. The Brocade SX6 requires Brocade FOS 8.0.1 or higher.

Q. Is there a minimum version of Brocade FOS required for the Brocade 7840?

A. The Brocade 7840 requires Brocade FOS 7.3 or higher.

Q. Is there a minimum version of Brocade FOS required for the Brocade FX8-24 and Brocade 7800?

A. The Brocade FX8-24 and Brocade 7800 require Brocade FOS 6.3 or higher.

Q. Can I use the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 for Fibre Channel and IP extension?

A. The Brocade 7840 and Brocade SX6 support both Fibre Channel and IP extension. However, the Brocade 7800 and Brocade FX8-24 support only Fibre Channel extension.

FCIP Technology

Q. What is FCIP?

A. FCIP was designed as a simple tunneling protocol to link Fibre Channel over distance on standard IP networks. Used primarily for remote replication, backup, and storage access, FCIP provides Fibre Channel connectivity over IP networks between Fibre Channel devices or fabrics. FCIP leverages special high-speed and Big Data TCP/IP processing, which is essential for storage applications to be reliable and available, and maintain data integrity over long distance. Table 3 outlines how FCIP is designed and used.

Table 3: FCIP protocol.

	FCIP
Use case	Enables replication, backup, and storage access over long distance
Benefit	Moves more data faster, farther, and reliably for disaster recovery, data protection, and data mobility solutions
Network	WAN/MAN
Transport	FCIP/TCP/IP/Ethernet
Encapsulation	Brocade encapsulates Fibre Channel data sequences into compressed batches. Those batches fill TCP segments to their maximum size and then form IP datagrams.
IP-routable	Yes

IP Extension Technology

Q. What is Brocade IP Extension?

A. Brocade IP Extension technologies help give storage administrators more control over their IP storage flows between data centers. There are five IP extension pillars: performance, operational excellence, enhanced availability, solid security, and easy deployment. IP Extension uses the same VE_Ports and circuits that FCIP uses, or it can use its own.

Brocade IP Extension is used primarily for IP storage applications, such as remote host-based or database-based replication, NAS replication, IP backups, and tape grids. It leverages special high-speed and Big Data TCP/IP processing, which is essential for storage applications to be reliable, available, and maintain data integrity over long distances. Table 4 outlines how Brocade IP Extension is designed and used.

Key advantages include:

- Brocade IP Extension proxies the local data center TCP sessions. This eliminates all latency effects and provides a clean, stable network that allows the end device to operate at its maximum performance. Brocade WAN-optimized TCP transports the data to the other data center, where another local TCP proxy communicates with the device on the other side.
- A multitude of IP storage flows is managed in a single tunnel so that the over-bandwidth usage across the WAN can be optimized and made more reliable. There is no way to optimize with rate limiting (or with other methods) a large number of individual autonomous flows across the WAN. Brocade IP Extension manages these individual flows using the TCP rwnd (Receive Window). Very large performance improvements have been demonstrated.
- The tunnel between data centers is optimized using Adaptive Rate Limiting, QoS, WAN-optimized TCP, and streams. WAN-optimized TCP is an aggressive and sophisticated TCP stack that maintains data transport across the most adverse conditions. It can do what individual TCP stacks on end devices cannot do.
- Brocade provides operational excellence with tools such as Brocade Network Advisor, Monitoring Alerting Policy Suite (MAPS), and the latest versions of Brocade Fabric OS. The system provides Brocade Fabric Vision, Flow Generator, WAN Test Tool (Wtool), Extension Dashboard, and more—all the tools needed to diagnose issues in an extension network. IP networking administrators seldom make these tools available to storage administrators.
- Brocade IP Extension can transport all IP storage flows encrypted using IPsec. IPsec on the Brocade 7840 is a hardware implementation, which implies two important things: There is very little added latency (5 µs) when performing encryption, and the throughput of encryption is exceptionally fast (line rate).
- Brocade has taken into account deployment concerns for IP Extension. There is no need to re-cable, change IP subnets, or change VLANs. Only the IP gateway for the subnet(s) located at the remote data center need to be changed to the Software Virtual Interface (SVI) on the Brocade 7840. This SVI acts as the gateway for the IP storage traffic headed across the WAN. The Brocade 7840 provides Link Aggregation (LAG) to the data center LAN switch(es) to which the IP storage is connected. LAG delivers adequate bandwidth and link redundancy for high availability.

Table 4: Brocade IP Extension protocol.

	FCIP
Use case	Enables replication, backup, and storage access over long distance
Benefit	Moves more data faster, farther, and reliably for disaster recovery, data protection, and data mobility solutions
Network	WAN/MAN
Transport	IP Extension/TCP/IP/Ethernet
Encapsulation	Brocade encapsulates IP flow (also called "streams") data sequences into compressed batches. Those batches fill TCP segments to their maximum size and then form IP datagrams.
IP-routable	Yes

Q. What are circuits?

A. Circuits are the building blocks for trunks. A trunk is a tunnel with more than one circuit. A circuit consists of a source and destination IP address pair and per-QoS TCP connections. An Ethernet port can be assigned one or more circuits. Each circuit automatically creates multiple TCP connections that can be used for QoS prioritization. This is part of PTQ (PerPriority TCP QoS).

Q. What is the impact of circuits on tunnels?

A. With the development of circuits, a tunnel is no longer bound to a single physical interface or a single connection to a peer Ethernet switch. The Brocade 7840 and 7800 Extension Switches and the Brocade FX8-24 Extension Blade create tunnels that are composed of one or more circuits, enabling Extension Trunking.

Q. What is Extension Trunking and how does it work?

A. Extension Trunking is an optional licensed feature that enables the creation of logical high-bandwidth tunnels ("trunks") composed of multiple circuits, and spanning multiple physical ports. Traffic within a trunk is balanced across all circuits to optimize bandwidth and performance. Trunks also overcome physical link failures with redundant paths, Lossless Link Loss (LLL), and guaranteed in-order data delivery.

The number of tunnels is synonymous with the number of VE_Ports. VE_Ports are the endpoints of a tunnel. The Brocade 7840 and Brocade SX6 support up to 20 tunnels in FCIP mode and up to 10 tunnels in hybrid (IP Extension) mode. Up to 20 tunnels are supported on the Brocade FX8-24. Up to eight tunnels are supported on the Brocade 7800. The Brocade FX8-24 provides up to 10 Gbps bandwidth for a single trunk using either 1 GbE ports or the optional 10 GbE ports. The maximum trunk size using the 1 GbE ports is 10 Gbps on the Brocade FX8-24, and 6 Gbps on the Brocade 7800. On the Brocade 7840 and the Brocade SX6, the maximum extension trunk size supported is 20 Gbps, and up to two such trunks can be configured per Brocade 7840 or Brocade SX6 when the maximum WAN rate is enabled.

Q. What is Brocade Adaptive Rate Limiting and how does it work?

A. Adaptive Rate Limiting is an optional licensed feature on the Brocade 7800 Extension Switch and Brocade FX8-24 Extension Blade, and is included on the Brocade 7840 and Brocade SX6. It dynamically adjusts shared bandwidth between guaranteed minimum rates and available maximum rates for each circuit within a trunk. This overcomes the problem of fixed provisioning of bandwidth, which leads to over-provisioning and underutilization of links. Adaptive Rate Limiting enables applications to exceed guaranteed minimum rates when competing bandwidth dissipates.

Q. What is PTQ (PerPriority TCP QoS) and how does it work?

A. PTQ extends Brocade Fabric OS QoS across extension links by putting those traffic flows into dedicated WAN-optimized TCP sessions for each priority. The extension blade or switch prioritizes traffic as high, medium, or low on a per-flow basis within a tunnel to optimize bandwidth by application. QoS is enforced only when congestion occurs at egress from the extension blade or switch. FCIP QoS integrates seamlessly with Brocade Fabric OS QoS for consistency throughout the entire fabric. IP Extension QoS operates the same way with the same priorities (high, medium, low) and is separate from FCIP QoS. There are seven priorities altogether: four for FCIP (including class-F) and three for IP Extension.

Q. What is Brocade Integrated Routing (FCR)?

A. Integrated Routing (FCR) is an optional licensed feature that leverages the latest Brocade ASIC technology to provide Fibre Channel routing on a per-port basis. Because a Fibre Channel E_Port can be made to act as an EX_Port, data can be communicated between fabrics while maintaining remote fabric isolation. Integrated Routing (FCR) eliminates the need for a dedicated router or consumption of chassis slots with special routing blades—thereby reducing cost, complexity, and management overhead.

Mainframe Technology

Q. Does Brocade support mainframe solutions?

A. Brocade provides as much as 95 percent of the total extension infrastructure used by the mainframe market, which includes FICON, ESCON, and bus and tag equipment for local switching or remote business solutions. With more than 20 years of experience and thousands of customers around the globe, Brocade offers valued products and services to help organizations meet their critical business objectives.

Q. What is FICON?

A. FICON is an IO protocol used between IBM (and compatible) mainframes and storage arrays. It takes the higher-layer ESCON protocol and maps it into a Layer 2 transport frame. It is mapped into the same physical layer and framing specifications as Fibre Channel but is unique to the FICON protocol. FICON and Fibre Channel protocols can reside within the same switching infrastructure.

Q. What Brocade products support FICON extension solutions?

A. The Brocade 7840 and 7800 Extension Switches and the Brocade SX6 and FX8-24 Extension Blades provide unique solutions for mainframe storage applications, including FICON disk emulation for IBM z/OS Global Mirror (zGM), also known as XRC (Extended Remote Copy), as well as FICON Tape Pipelining for write and read operations for IBM and Oracle virtual and standalone tape offerings.

Q. What licenses are required for FICON functionality?

A. For Brocade Fabric OS fabrics, all functional capabilities required to support FICON are included in the base release. Optional FICON features separately licensed for the Brocade 7840 and 7800 Extension Switches and the Brocade FX8-24 Extension Blade include:

- **Brocade Advanced Accelerator for FICON:** Enables high-performance FICON tape and zGM replication over distance.
- **Brocade FICON Management Server:** Control Unit Port (CUP) enables host control of switches in mainframe environments.

Q. What is CUP (FICON Management Server)?

A. Control Unit Port (CUP) is an in-band management function that enables mainframe applications to perform configuration, monitoring, management, and statistics collection functions. Several IBM mainframe management applications require CUP functionality on FICON backbones, directors, or switches. The Brocade FICON Management Server license enables CUP functionality.

Q. Do the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24 provide ESCON and bus and tag support?

A. Yes. These products support z/OS host connectivity to ESCON and bus and tag devices via external Optica Prizm (and ESBT) for FICON initiator to ESCON (and bus and tag) target protocol conversion. The solution provides extension for legacy ESCON and bus and tag tape controllers and select printers. ESCON and bus and tag disk are not supported.

Q. What FICON data rates are supported?

A. Brocade supports FICON at the data rates consistent with industry standards. Host and storage interfaces supported include 1, 2, 4, 8, 16, and 32 Gbps FICON interfaces.

Q. Can FICON be intermixed with open systems?

A. Yes. Brocade Virtual Fabrics is supported on the Brocade 7840 with Brocade FOS 7.3, the Brocade SX6 with Brocade FOS 8.0.1, and the Brocade 7800 and Brocade FX8-24 through Brocade FOS 7.0 and 7.1, respectively. Brocade Virtual Fabrics allows fabrics that are each configured with specific characteristics for open systems or z/OS environments to share the same platform—and even the same Ethernet interface—enabling consolidation while providing traffic isolation in mixed environments. The Brocade 7840 with Brocade FOS 7.3 or later and the Brocade 7800 with Brocade FOS 7.1 or later support up to four logical switches/two CUP instances. The Brocade SX6 with Brocade FOS 8.0.1 and the Brocade FX8-24 with Brocade FOS 7.0 or later support up to eight logical switches/four CUP instances.

Extension Management

Q. What management tools are available for the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24?

A. Management and administrative operations can be performed through familiar Brocade management tools, including Brocade Network Advisor, Brocade Web Tools, and the Command Line Interface (CLI). Moreover, optional FICON CUP capabilities enable IBM mainframe management applications to seamlessly support Brocade FICON environments (only available in the Enterprise edition of Brocade Network Advisor).

For more information on Brocade Network Advisor, visit: www.brocade.com/networkadvisor.

Q. Is Brocade Network Advisor required to manage the Brocade 7840, Brocade 7800, Brocade SX6, and Brocade FX8-24?

A. No. However, Brocade Network Advisor does include the following enhanced FCIP management capabilities that help simplify and unify management of extension network infrastructures:

- View health and performance indicators in customizable browser-accessible dashboards, saving administrative time and effort
- Quickly perform root-cause analysis with point-in-time playback to discover and resolve network issues
- Provide a comprehensive topology view of all tunnels and trunks across all fabrics discovered by Brocade Network Advisor
- Simplify tunnel and trunk configuration and management with a wizard interface
- Drill down through the topology or dashboards to view and configure connection and switch properties

Q. Is there a minimum version of Brocade Network Advisor required for the Brocade 7840 and Brocade SX6 extension products?

A. Brocade Network Advisor 12.3 or above is required to manage the Brocade 7840. Brocade Network Advisor 14.0.1 or above is required to manage the Brocade SX6.

Learn More

Q. How do I find out more about Brocade extension products?

A. Contact your Brocade sales representative or Brocade OEM Partner for details. Or visit www.brocade.com/products.

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