BROCADE VDX 8770 SWITCH

DATA CENTER

Scaling Out Brocade VCS Fabrics

HIGHLIGHTS

- Simplifies network architectures and enables elastic cloud networking with Brocade VCS Fabric technology
- Delivers 40 Gigabit Ethernet (GbE) wire-speed switching with auto-trunking Inter-Switch Links (ISLs) for non-disruptive scaling and increased bandwidth utilization
- Enables easy scale-out of Brocade VCS fabrics with massive Layer 2 domains and direct connections for more than 8000 server ports per fabric
- Provides efficiently load-balanced multipathing at Layers 1, 2, and 3, with multiple Layer 3 gateways
- Simplifies Virtual Machine (VM) mobility and management with automated, dynamic port profile configuration and migration
- Provides scale-out performance and investment protection with a 100 GbE-ready, 4 Tbps line-rate backplane design and 4-microsecond latency
- Is designed to support Software-Defined Networking (SDN) implementations across data, control, and management planes

The Brocade One® strategy helps simplify networking infrastructures through innovative technologies and solutions. Brocade VDX 8770 Switches support this strategy by simplifying network architecture while increasing network performance and resilience with Brocade VCS Fabric technology.

Today's organizations face an increasingly competitive marketplace and must be able to deploy new services quickly. More than ever, they need a data center infrastructure that is agile, flexible, reliable, and cost-effective. At the same time, many of these organizations are seeking to increase data center automation and efficiency through virtualization. To succeed, they must find ways to adapt existing IT infrastructure to flexible and responsive IT models.

Brocade® VCS® fabrics running on the Brocade VDX® family of switches allow organizations to create data center networks that just work. Together, these technologies provide unmatched automation and resilience in support of the most demanding workloads, such as big data, rich media, and mission-critical applications. Moreover, Brocade VCS Fabric technology supports an easy transition from traditional Ethernet to powerful Ethernet fabrics and cloud computing infrastructure, without disrupting existing data center network architecture. To learn more about Brocade VCS Fabric technology, visit www.brocade.com/vcs.

UNMATCHED SIMPLICITY, SCALE-OUT PERFORMANCE

The Brocade VDX 8770 Switch is designed to scale out Brocade VCS fabrics and support complex environments with dense virtualization and dynamic automation requirements. Available in both four-slot and eight-slot versions, the 100 Gigabit

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WHAT IS AN ETHERNET FABRIC?

Compared to classic hierarchical Ethernet architectures, Ethernet fabrics provide higher levels of performance, utilization, availability, and simplicity (see Figure 1). They are designed to be:

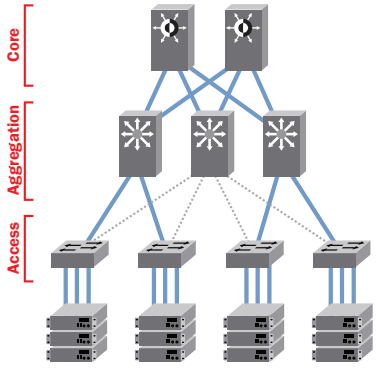
- **Flatter:** Eliminates the need for Spanning Tree Protocol (STP), while being completely interoperable with existing Ethernet networks
- **Flexible:** Can be architected in any topology to best meet the needs of any variety of workloads
- **Resilient:** Uses multiple "least cost" paths for high performance and high reliability
- **Elastic:** Scales easily up and down as needed

More advanced Ethernet fabrics borrow further from Fibre Channel fabric constructs:

- They are self-forming and function as a single logical entity, in which all switches automatically know about each other and all connected physical and logical devices.
- Management can then be domain-based rather than device-based, and defined by policy rather than repetitive procedures.
- These features, along with virtualization-specific enhancements, make it easier to address the challenges of VM automation within the network, thereby facilitating better IT automation.
- Protocol convergence, such as Fibre Channel over Ethernet (FCoE), may also be a feature, intended as a means of better bridging LAN and Storage Area Network (SAN) traffic.

Learn more about Ethernet fabrics at www.brocade.com/ethernet-fabric.

Classic Hierarchical Ethernet Architecture



Ethernet Fabric Architecture

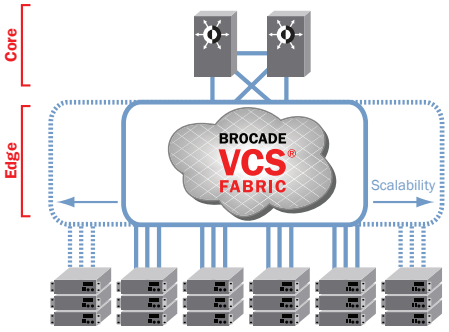


Figure 1.
Compared to classic Ethernet architectures, Ethernet fabrics allow all paths to be active and provide greater scalability—while reducing management complexity.

Ethernet (GbE)-ready Brocade VDX 8770 provides a highly scalable, low-latency 1/10/40 GbE modular switch:

- **Automated for unmatched simplicity:** The Brocade VDX 8770 and Brocade VCS Fabric technology deliver a greatly simplified network that can save time and resources with elastic, self-forming, and self-healing fabrics. Management is streamlined with seamless, zero-touch VM discovery, network configuration, and VM mobility. Multi-node fabrics can be managed as a single logical element.
- **Designed for scale-out performance:** As a scale-out platform for the world's most demanding application performance requirements, the Brocade VDX 8770 supports high-density, line-rate 10 GbE and 40 GbE interfaces with a 4 Tbps line-rate backplane design that provides long-term investment protection. The Brocade VDX 8770 enables the growth and elasticity of Layer 2 domains through load-balanced multipathing at multiple layers. Able to support more than 8000 server ports in a fabric, the Brocade VDX 8770 also provides industry-leading support for latency-sensitive applications, such as imaging and analytics, with approximately 4-microsecond latency between any two ports.
- **Built to last:** Future-proofed to support the next wave of data center innovations, the Brocade VDX 8770 is 100 GbE-ready. In addition, the Brocade VDX 8770 is hardware-enabled to flexibly support emerging Software-Defined Networking (SDN) protocols such as OpenFlow, VXLAN/NVGRE, and others. RESTful APIs provide openness to emerging management frameworks such as OpenStack.

DESIGNED FOR THE MOST DEMANDING DATA CENTER NETWORKS

The Brocade VDX 8770 delivers a high-performance switch to support the most demanding data center networking needs. Key features include:

- Support for 1, 10, and 40 GbE to satisfy current needs, with 100 GbE readiness to support future bandwidth requirements and technology
- 4 Tbps per slot line-rate design for substantial capacity and headroom
- 4-microsecond latency to assure rapid response for latency-sensitive applications
- Support for up to 384,000 MAC addresses per fabric for extensive virtualization scalability
- Support for more than 8000 ports in a single VCS fabric with efficient multipathing technology, enabling the switch to serve extremely large-scale deployments with the best-possible network utilization

A Choice of Chassis with Multiple Line Cards

The flexible, modular switch design offers interconnection with other Brocade VDX 8770 switches; Brocade VDX 6710, 6720, and 6730 fabric switches; traditional Ethernet switch infrastructures; and direct server connections. Modular four-slot and eight-slot chassis options are available to match the switch to the needs of the organization. These include:

- **Brocade VDX 8770-4:** Supports up to 192 10 GbE ports, 48 40 GbE ports, or a combination
- **Brocade VDX 8770-8:** Supports up to 384 10 GbE ports, 96 40 GbE ports, or a combination

The Brocade VDX 8770 supports a variety of wire-speed line cards to offer maximum flexibility in terms of port bandwidth as well as cable and connector technology:

- **1 GbE:** 48×1 GbE line card provides up to 48 SFP/SFP-copper ports
- **10 GbE:** 48×10 GbE line card provides up to 48 SFP+ ports
- **40 GbE:** 12×40 GbE line card provides up to 12 40 GbE QSFP ports

Aggregation and Migration for Traditional Ethernet Environments

Organizations utilizing traditional Ethernet technology need sensible ways to scale and expand their networks, while enabling seamless migration to fabric-based technologies to support advanced virtualization. For organizations with traditional hierarchical Ethernet environments, the Brocade VDX 8770:

- Aggregates multiple traditional access-tier switches in an aggregation-tier fabric, with efficient multipathing capabilities at multiple layers to insulate core switches from unnecessary traffic
- Provides access-layer fabric capabilities in end-of-row or middle-of-row configurations
- Establishes a migration path for organizations to adopt and grow resilient and scalable Brocade VCS fabrics

Elasticity, Scalability, and Flexibility for VCS Fabrics

VCS fabrics support considerable elasticity, compared to both traditional Ethernet networks and competitive Ethernet fabric solutions. With Brocade, organizations can start with small VCS fabrics and scale out the fabric as their needs dictate.

Innovative Brocade VCS Fabric technology enables organizations to build high-performance, cloud-optimized data centers while preserving existing network core investments and cabling, gaining active-active server connections, and improving east-west traffic flow. Brocade VCS fabrics easily scale out and interconnect to optimize the performance of virtualized and clustered applications of all types, including big data, rich media, and mission-critical enterprise applications. In addition, the VCS fabric architecture is designed for flexible policy and services management of physical and logical networks together.

For organizations deploying Brocade VCS fabrics, the Brocade VDX 8770:

- Creates large, homogeneous fabrics by aggregating multiple switch domains with a logically flat network topology
- Interconnects multiple Brocade VCS fabrics for highly scalable Layer 2 domains, complete with automatic and secure support for VM mobility
- Provides a high-density access layer fabric to directly connect more than 8000 servers into a Brocade VCS fabric
- Offers a migration path from 1 to 100 GbE and from traditional hierarchical configurations to Brocade VCS fabric deployments

The Brocade VDX 8770 can be used to build a wide range of VCS fabrics, including:

- **Small-scale VCS fabrics:** Can collapse access and aggregation tiers using the Brocade VDX 8770 as a port-dense, middle-of-row/end-of-row access switch
- **Medium-scale VCS fabrics:** Can utilize the Brocade VDX 8770 as a spine switch in combination with Brocade VDX 6710, 6720, and 6730 leaf switches
- **Large-scale VCS fabrics:** Can use the Brocade VDX 8770 homogeneously as both a leaf and spine switch

Multiple Load-Balanced Paths at Layers 1-3

Ethernet fabrics have improved the way organizations deploy, use, and maintain their network access layers. Unfortunately, traditional Layer 3 routing often adds wasted bandwidth, multiple network hops for east-west traffic (increasing latency), and the need to manually configure every aspect of Layer 3 connectivity.

With Network OS 3.0, Brocade VCS Fabric technology enables highly elastic Layer 2 and Layer 3 domains with extremely efficient load balancing and multiple active Layer 3 gateways, on top of L2 ECMP and Brocade ISL Trunking. The results are more effective link utilization that reduces overall cost, more resilience that results in greater application uptime, and a more flexible and agile network that helps organizations rapidly adapt to changing business conditions.

Optimized for Virtualization

Brocade VCS Fabric technology offers unique features to support virtualized server and storage environments, including:

- **Brocade VM-aware network automation:** Brocade VM-aware network automation provides secure connectivity and full visibility to virtualized server resources with dynamic learning and activation of port profiles. By communicating directly with VMware vCenter, it eliminates manual configuration of port profiles and supports VM mobility across VCS fabrics within the data center.
- **Automatic Migration of Port Profiles:** During a VM migration, network switch ports must be dynamically configured to ensure that the VM traffic experiences consistent policies and configurations. The Brocade Automatic Migration of Port Profiles (AMPP) feature enables a seamless migration, since the VCS fabric is aware of port profiles and automatically tracks them as they move. Implemented in a hypervisor-agnostic manner, port profiles and MAC address mapping are created on any switch in the fabric. This mapping provides the logical flow for traffic from the source port to the destination port. As a VM migrates, the destination port in the fabric learns of the MAC address move and automatically

activates the port profile configuration within a single fabric or across separate fabrics.

- **Optimized east-west traffic:** Increasing east-west traffic is typical for today's virtualized environments, with increased inter-VLAN traffic and the need for support of VM migration activities such as VMware VMotion. With efficient multipathing capabilities, Brocade VDX switches at the access layer can easily be configured to perform Layer 3 routing functionality for very efficient inter-VLAN routing.

PROACTIVE MONITORING

Brocade Fabric Watch is an innovative switch health monitoring feature available on all Brocade VDX switches. Fabric Watch monitors the health of certain switch components and, based on the threshold set, declares each component as marginal or down.

EASE OF USE AUGMENTED BY BROCADE NETWORK ADVISOR

Brocade Network Advisor is an easy-to-use network management platform for advanced management of Brocade VCS fabrics and Brocade VDX switches across the entire network life cycle. Organizations can use Brocade Network Advisor to manage a VCS fabric as a single entity or to drill down to individual Brocade VDX switches for fault, inventory, or performance management—and to manage multiple VCS fabrics in parallel.

Brocade Network Advisor also provides simplified management of AMPP configurations, and integrity checks can be performed across physical Brocade VDX configurations, either in the same cluster or across different VCS clusters. In addition, Brocade Network Advisor enables VM-level monitoring and can help identify top-talker applications leveraging sFlow across the fabric. Finally, Brocade Network Advisor provides VCS fabric diagnostics, including visualization of VCS fabric traffic paths and network latency monitoring that enables fault isolation via hop-by-hop inspection. For details, visit www.brocade.com/management.

SUPPORT FOR CURRENT AND FUTURE APPLICATION NEEDS

The Brocade VDX 8770 and Brocade VCS fabrics offer benefits for today's most compelling and demanding applications, including:

- **Rich media:** Service providers and cloud providers require support for significant east-west traffic within their data centers, along with support for large numbers of VMs and VM mobility. Content providers with applications such as video on demand require support for significant amounts of north-south traffic. The Brocade VDX 8770 and Brocade VCS fabrics are ideal for these applications, as they provide a low-latency, cut-through architecture and considerable throughput to enable balanced east-west and north-south traffic performance.
- **Big data:** To realize business benefits from their unstructured data, organizations require seamless access to both compute and storage resources. High-performance computing environments process large amounts of data that drive significant east-west traffic patterns and require low latency for IPC interconnection. Big data has emerged as a critical technology trend, and the Brocade VDX 8770 provides key advantages such as high-performance, line-rate 10 GbE and 40 GbE.
- **Mission-critical applications:** A wide variety of enterprise applications can take advantage of the Brocade VDX 8770, including ERP, Virtual Desktop Infrastructure (VDI), and collaboration applications such as Microsoft Exchange and SharePoint. The virtualization-aware networking characteristics of the Brocade VDX 8770 and Brocade VCS fabrics, along with high-availability and essential security functionality, help ensure that critical data services function as intended while protecting vital data from corruption or loss.

BROCADE GLOBAL SERVICES

Brocade Global Services has the expertise to help organizations build scalable, and efficient cloud infrastructures. Leveraging 15 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.

CLOUD-OPTIMIZED NETWORK ACQUISITION

Brocade helps organizations easily address their information technology requirements by offering flexible network acquisition and support alternatives to meet their financial needs. Organizations can select from purchase, lease, and Brocade Network Subscription options to align network acquisition with their unique capital requirements and risk profiles. To learn more, visit www.Brocade.com/CapitalSolutions.

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, please contact a Brocade sales partner or visit www.brocade.com.

BROCADE VDX 8770 FEATURE OVERVIEW

	Brocade VDX 8770-4	Brocade VDX 8770-8
Port-to-port latency (64 byte packets)	<4 microseconds	<4 microseconds
Form factor	8U	15U
Slots	4	8
Dimensions and weight	Width: 43.74 cm (17.22 in.) Height: 34.7 cm (13.66 in.) Depth: 60.96 cm (26 in.) Weight: 31.75 kg (70 lb) Weight (fully loaded): 86.18 kg (190 lb)	Width: 44 cm (17.32 in.) Height: 66.2 cm (26.06 in.) Depth: 66.04 cm (26 in.) Weight: 61.24 kg (135 lb) Weight (fully loaded): 165.55 kg (365 lb)
1 GbE SFP/SFP-copper ports	192	384
10 GbE SFP+ ports	192	384
40 GbE QSFP ports	48	96
Power supplies	4 max	8 max
Cooling fans	2	4
Airflow	Side-to-back airflow, with front-to-back duct converter option	Front-to-back airflow

BROCADE VDX 8770 SPECIFICATIONS

Scalability Information*	
Connector options	1 GbE copper SFP options 10 Gbps SFP+ options: 1/3/5 m direct-attached copper (Twinax) 10 GbE SR and 10 GbE LR 40 GbE QSFP
Maximum VLANs	4096
Maximum MAC addresses	384,000
Maximum IPv4 routes	352,000
Maximum IPv6 routes	88,000
Maximum ACLs	57,000
Maximum port profiles (AMPP)	256
Maximum ARP entries	128,000
Maximum members in a standard LAG	64
Maximum switches in a VCS fabric	24
Maximum ECMP paths in a VCS fabric	8
Maximum trunk members for VCS fabric ports	8
Maximum switches across which a vLAG can span	4
Maximum members in a vLAG	32
Maximum jumbo frame size	9216 bytes
DCB Priority Flow Control (PFC) classes	8
Brocade VDX 8770 Modules and Line Cards	
Management Module (half-slot)	• Multicore processor • 8 GB SDRAM, USB port • Console, management port, auxiliary service port (all RJ-45)
Gigabit Ethernet access (fiber/copper) line card	• 48-port SFP/SFP-copper
10 GbE access or aggregation line card	• 48-port SFP+ (10 GbE/1 GbE)
40 GbE aggregation line card	• 12-port QSFP module

** Please refer to the latest version of the release notes for the most up-to-date scalability numbers supported in software.*

BROCADE VDX 8770 SPECIFICATIONS (CONTINUED)

General		
Operating system	Brocade Network OS	
Layer 2 switching features	• MAC Learning and Aging • Static MAC Configuration • Link Aggregation Control Protocol (LACP) 802.3ad/802.1AX • Virtual Local Area Networks (VLANs) • VLAN Encapsulation 802.1Q • Layer 2 Access Control Lists (ACLs)	• Address Resolution Protocol (ARP) RFC 826 • IGMP v1/v2 Snooping • Pause Frames 802.3x • Multiple Spanning Tree Protocol (MSTP) 802.1s† • Rapid Spanning Tree Protocol (RSTP) 802.1D† • Per-VLAN Spanning Tree (PVST+/PVRST+)†
Brocade VCS Fabric technology features	• Automatic Fabric Formation • Automatic Migration of Port Profiles (AMPP) • VM-aware network automation • Distributed Fabric Services • Transparent LAN Services • Virtual Link Aggregation Group (vLAG) spanning multiple physical switches	• Distributed Configuration Management • Transparent Interconnection of Lots of Links (TRILL) • Equal Cost Multi-Path (ECMP) • VRRP-E
DCB features	• Priority-based Flow Control (PFC) 802.1Qbb • Enhanced Transmission Selection (ETS) 802.1Qaz	• Data Center Bridging eXchange (DCBX) • DCBX Application Type-Length-Value (TLV) for FCoE and iSCSI
FCoE features	• Multihop Fibre Channel over Ethernet (FCoE); requires Brocade VCS Fabric technology • FC-BB5-compliant Fibre Channel Forwarder (FCF) • FIP Snooping Bridge connectivity support • Native FCoE forwarding	• End-to-end FCoE (initiator to target) • FCoE Initialization Protocol (FIP) v1 support for FCoE devices login and initialization • Name Server-based zoning
Quality of Service (QoS)	• Eight priority levels for QoS • Class of Service (CoS) 802.1p	• Per-port QoS configuration • Scheduling: Strict Priority (SP), Shaped Deficit Weighted Round-Robin (SDWRR)
Switch health monitoring	• Fabric Watch monitoring and notification	
Management		
Management and control	• IPv4/IPv6 management • Industry-standard Command Line Interface (CLI) • Link Layer Discovery Protocol (LLDP) IEEE 802.1AB • MIB II RFC 1213 MIB • Switch Beaconing • Switched Port Analyzer (SPAN)	• Telnet • SNMP v1/v2C, v3 • sFlow RFC 3176 • RMON-1, RMON-2 • NTP • Management Access Control Lists (ACLs) • Role-Based Access Control (RBAC)
Security	• Port-based Network Access Control 802.1X • RADIUS • TACACS+	• Secure Shell (SSHv2) • BPDU Drop • Lightweight Directory Access Protocol (LDAP)
Mechanical		
Enclosure	19-inch EIA-compliant; power from port side	
Environmental		
Temperature	Operating: 0°C to 40°C (32°F to 104°F) Non-operating and storage: –25°C to 70°C (–13°F to 158°F)	
Humidity	Operating: 10% to 85% non-condensing Non-operating and storage: 10% to 90% non-condensing	
Altitude	Operating: Up to 3000 meters (9842 feet) Non-operating and storage: Up to 12 kilometers (39,370 feet)	
Airflow	Brocade VDX 8770-4 Maximum: 675 CFM Nominal: 200 CFM Brocade VDX 8770-8 Maximum: 1250 CFM Nominal: 375 CFM	

† *To be enabled with a future software release.*

Power	
Max power utilization‡	Brocade VDX 8770-4: 2872 W Brocade VDX 8770-8: 5644 W
Power inlet	C19
Input voltage	200 to 240 VAC (Operating voltage range: 180 to 264 VAC)
Input line frequency	50/60 Hz
Maximum current	AC: 16.0 A max. per power supply DC: 70.0 A max per power supply

Safety Compliance

- UL 60950-1 Second Edition
- CAN/CSA-C22.2 No. 60950-1 Second Edition
- EN 60950-1 Second Edition
- IEC 60950-1 Second Edition
- AS/NZS 60950-1

EMC

- 47CFR Part 15 (CFR 47) Class A
- AS/NZS CISPR22 Class A
- CISPR22 Class A
- EN55022 Class A
- ICES003 Class A
- VCCI Class A
- EN61000-3-2
- EN61000-3-3
- KN22 Class A

Immunity

- EN55024
- CISPR24
- EN300386
- KN 61000-4 series

Environmental Regulatory Compliance

- RoHS-compliant (with lead exemption) per EU Directive 2002/95/EC

Standards Compliance

The Brocade VDX 8770 products conform to the following Ethernet standards:

- IEEE 802.3ad Link Aggregation with LACP
- IEEE 802.3ae 10G Ethernet
- IEEE 802.1Q VLAN Tagging
- IEEE 802.1p Class of Service Prioritization and Tagging
- IEEE 802.1v VLAN Classification by Protocol and Port
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3x Flow Control (Pause Frames)
- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1s Multiple Spanning Tree
- IEEE 802.1w Rapid Reconfiguration of Spanning Tree Protocol

The following draft versions of the Data Center Bridging (DCB) and Fibre Channel over Ethernet (FCoE) standards are also supported on the Brocade VDX 8770:

- IEEE 802.1Qbb Priority-based Flow Control
- IEEE 802.1Qaz Enhanced Transmission Selection
- IEEE 802.1 DCB Capability Exchange Protocol (Proposed under the DCB Task Group of IEEE 802.1 Working Group)
- FC-BB-5 FCoE (Rev 2.0)

‡ *Delivered power based on fully populated system with 10 GbE ports.*

BROCADE VDX 8770 ORDERING INFORMATION

SKU	Description
BR-VDX8770-4-BND-AC	4-slot chassis with three Switch Fabric Modules, one Management Module, two fans, two 3000 W power supply units AC
BR-VDX8770-4-BND-DC	4-slot chassis, three Switch Fabric Modules, one Management Module, two fans, two 3000 W power supply units DC
BR-VDX8770-8-BND-AC	8-slot chassis, six Switch Fabric Modules, one Management Module, four fans, three 3000 W power supply units AC
BR-VDX8770-8-BND-DC	8-slot chassis, six Switch Fabric Modules, one Management Module, four fans, three 3000 W power supply units DC
XBR-VDX8770-4	4-slot chassis, no Switch Fabric Modules, no Management Modules, two fans, no power supply units
XBR-VDX8770-8	8-slot chassis, no Switch Fabric Modules, no Management Modules, four fans, no power supply units
BR-VDX8770-48X10G-SFPP-1	48×10 GbE, SFP+ blades, no optics
BR-VDX8770-12X40G-QSFP-1	12×40 GbE, QSFP, blades, no optics
BR-VDX8770-48X1G-SFP-1	48×1 GbE, SFP blade, no optics
BR-VDX8770-MM-1	Management Module
BR-VDX8770-SFM-1	Switch Fabric Module
XBR-FAN-FRU	Fan FRU for 4- and 8-slot chassis
XBR-ACPWR-3000	3000 W power supply unit AC
XBR-DCPWR-3000	3000 W power supply unit DC
BR-VDX8770-LIC-FCOE	FCoE feature chassis license
BR-VDX8770-LIC-VCS	VCS feature chassis license
BR-VDX8770-LIC-LAYER3	Layer 3 feature chassis license
BR-VDX8770-LIC-ADV	Advanced feature chassis license (includes Layer 3, FCoE, and VCS licenses)
BR-VDX8770-LIC-UPG	Upgrade license from VCS, FCoE, or Layer 3 features to Advanced license

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