BROCADE®

Brocade MLXe Enterprise Switches

Multiservice IP SDN Switches

The way enterprise organizations communicate and conduct business has changed dramatically in the past decade. Services such as high-definition video streaming, hybrid cloud services, and anytime/anywhere mobile connectivity not only consume an enormous amount of network capacity, but also create a greater degree of complexity for network operations. As a result, today's network planners are seeking solutions that provide the right mix of scalability, performance, programmability, and operational simplicity.

The Brocade® MLXe Enterprise Switches are built with a state-of-the-art, sixth-generation, network processor-based architecture and terabit-scale switch fabrics to provide a rich set of high-performance Layer 2, IPv4, IPv6, wire-speed encryption, and Software-Defined Networking (SDN) services. As a result, these switches address the increasing business needs in the data center and campuses of commercial enterprises, higher education, and public sector organizations.

Flexibility, Scale, and Investment Protection without Performance Compromise

The Brocade MLXe Enterprise Switches are optimized for IP Ethernet deployments, providing symmetric scaling with chassis options that include 4- and 8-slot systems. These switches offer industry-leading wire-speed port capacity without compromising the performance of advanced software capabilities. Support for dense wire-speed 100 GbE, 40 GbE, 10 GbE and 1 GbE, flexible MAC and route scale and port-level hardware based encryption (IPsec and MACsec) in these multiple modular chassis sizes support the needs for campus and data center core and border in all organizations.

Industry-Leading SDN for Programmatic Control of the Network

Software-Defined Networking (SDN) is a powerful new network paradigm that promises breakthrough levels of customization, agility, and scale, enabling more open, automated, and efficient networks. The Brocade MLXe Enterprise Switches enable SDN through support for the OpenFlow protocol. This open protocol allows communication between an OpenFlow-enabled controller and an OpenFlow-enabled switch for the purpose of controlling network forwarding behavior. Using this approach, organizations can separate fine-grained flow control from the individual forwarding

BROCADE SDN CONTROLLER AND THE BROCADE MLXE ENTERPRISE SWITCH

The Brocade MLX Series operates seamlessly under the Brocade SDN Controller. This controller is a quality-assured edition of the OpenDaylight controller code supported by an established networking provider and its leaders within the OpenDaylight community.

devices and control their entire network programmatically. The flexibility for customized and dynamic end-user or application-centric flow control with this approach helps transform the network into a platform for innovative new services and application models while helping maximize resource utilization and automate decisions based on policy and real-time analytics.

The Brocade MLXe Enterprise Switches support OpenFlow 1.3 in Hybrid Port Mode. This innovative forwarding architecture allows concurrent support of traditional switching protocols and the OpenFlow protocol for SDN on the same port. This approach enables deployment of a single switch with simultaneous support for both traditional switching and SDN on a single port. This highly differentiated capability enables interworking between legacy networking and the New IP, allowing SDN to be applied to immediate business needs while providing a pragmatic path to a SDN architecture. The sixth-generation Brocade VersaScale™ processor of the Brocade MLXe Enterprise Switches provides hardware support for all protocols, including OpenFlow. This programmable forwarding engine delivers the leading scale and performance of hardware with the flexibility of software that organizations need in the demanding yet dynamic environments of modern IT driven by mobile, social, and cloud technologies.

Designed for Non-Stop Networking

Designed to enable reliable converged infrastructures and support mission-critical applications, the Brocade MLXe Enterprise Switch features advanced redundant switch fabric architecture for very high availability. The architecture helps ensure that the system continues to operate at peak performance even in the case of a switch fabric card failure. In the highly unlikely case of additional fabric failures, the advanced architecture allows the system to continue operating as the system tunes its performance to the remaining fabric capacity.

The advanced fabric architecture is complemented by comprehensive hardware redundancy for the management modules, power supplies, and cooling system. In addition, the Brocade NetIron Operating System (NIOS) offers hitless management failover for IPv4 and IPv6 with Open Shortest Path First (OSPF), IS-IS, and IP multicast non-stop routing, and Border Gateway Protocol (BGP) Graceful Restart capabilities—as well as hitless (in-service) software upgrades to further enhance both system availability and overall network availability. To maintain continuous operations in data centers and metro networks, the innovative Brocade Multi-Chassis Trunking (MCT) feature provides fast link and node failover protection while simultaneously maximizing network utilization. Additionally, the robust control plane of the Brocade MLXe Enterprise Switch

is proven in thousands of mission-critical deployments around the globe, supporting networks with the highest reliability.

Advanced Capabilities for a Broad Range of Applications

The Brocade MLXe Enterprise Switch provides a wide range of capabilities to support advanced applications and services in the most demanding network environments, including the data center and campus.

In-Flight Data Security without Compromising Network Performance

The Brocade MLXe Enterprise Switches provides inline IPsec encryption at wire speed, ensuring security of all data at Layer 3 across a network link without compromising performance or complicating deployment models. With support for four ports of 10/1 GbE (combo) and four ports of 1 GbE, the IPsec interface module supports an industry-leading capacity of more than 44 Gbps encrypted traffic per half-slot and up to 32 10 GbE ports of IPsec-encrypted traffic in a single system. The port-based IPsec does not require spate encryption services modules, allowing for more free slots in the chassis for additional interface modules, simplifying sparing configuration and operations and reducing upfront capex. Built on the innovative Brocade VersaScale™ processor, the programmable forwarding engine enables in-line hardware support for one of the strongest commercially available cryptographic suites—IPsec Suite B—with support for AES 256-bit keys. For data security at Layer 2, the Brocade MLXe Enterprise Switches also support IEEE 802.1AE (MACsec), which provides high-density, 128-bit, port-based, hop-by-hop encryption at wire-speed for 10 Gbe and 1 GbE.

Simplified Service Management To simplify the manageability of Ethernet services, the Brocade MLXe Enterprise Switch leverages Brocade Network Advisor, an application that unifies network management for all Brocade products. In addition, the sFlow-based technology utilized by Brocade Network Advisor reduces network downtime with proactive monitoring, traffic analysis, and reporting.

The standards-based sFlow technology supported by the Brocade MLXe Enterprise Switches provides traffic monitoring technology, enabling unprecedented visibility into real-time network usage. Integrated into the line module hardware, the sFlow technology enables the monitoring of high-speed links without impacting performance.

Enabling Green Operations

Although adding routers to address bandwidth shortage might initially solve the capacity problem, it does so at the expense of the environment and the opportunity to reduce energy and space costs. Any new solution that fails to reduce energy consumption is only a partial answer to the problem. Each new generation of line modules in the MLXe Enterprise switch consumes less energy per bit than the previous generation while significantly increasing throughput per module. In addition, the switches provide industry-leading port densities for 1 GbE, 10 GbE, 40 GbE, and 100 GbE interfaces, efficiently consolidating more services and collapsing network layers.

The Brocade MLXe Enterprise Switch Interface

The Brocade MLXe Enterprise Switch provides a wide range of leading-edge Ethernet modules for 1 GbE, 10 GbE, 40 GbE, and 100 GbE that enable organizations to use a single platform for many applications. For more information about these modules, see Tables 1 and 2.

Brocade Global Services

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

Affordable Acquisition Options

Brocade Capital Solutions helps organizations easily address their IT requirements by offering flexible network acquisition and support alternatives. Organizations can select from purchase, lease, Brocade Network Subscription, and Brocade Subscription Plus 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, contact a Brocade sales partner or visit www.brocade.com.

Table 1. Brocade MLXe Enterprise Switch Interface Modules.

Interface Module	Versions Supported			
	–DM	–M	–X	–X2
24×1 GbE RJ45		●	●	
24×1 GbE Fiber		●	●	
48×1 GbE MRJ21		●		
8×10 GbE		●	●	
24×10 GbE	●			
20×10 GbE		●		●
20×1 GbE (upgradable to 10 GbE)		●		●
4×10 GbE IPsec		●		
4×40 GbE		●		
2×100 GbE CFP2		●		●

Table 2. Supported Route Table Scalability for Brocade MLXe Enterprise Switch Interface Modules.

Interface Module Version	Supported Route Table Scalability
–DM	Up to 256,000 IPv4 routes Up to 64,000 IPv6 routes
–M	Up to 512,000 IPv4 routes Up to 256,000 IPv6 routes
–X	Up to 1 million IPv4 routes Up to 240,000 IPv6 routes
–X2	Up to 2.4 million IPv4 routes Up to 1.8 million IPv6 routes

Technology Summary

Comprehensive, wire-speed, dual-stack IPv4/IPv6 routing support based on the Brocade NetIron OS:

- High-performance, robust routing using Forwarding Information Base (FIB) programming in hardware

- RIP/RIPng, OSPF/OSPFv3, IS-IS/IS-IS for IPv6, and BGP-4/BGP-MP for IPv6

- Secure Multi-VRF routing for supporting virtual routing applications

- VRRP and VRRP-E

- 127-bit IPv6 interface addresses

Industry-leading scalability up to:*

- 10 million BGP routes

- 2.4 million IPv4 routes in hardware (FIB)

- 1.8 million IPv6 routes in hardware (FIB)

- 153,600 multicast routes

- 2,000 BGP peers per system

- 4,094 VLANs and up to 2 million MAC addresses

Software-Defined Networking (SDN):

- OpenFlow 1.3: QoS (for metering and enqueue), Group Table (select and fast failover), QinQ (TAG type auto-recognition), Active-Standby Controller, IPv6, Transport Layer Security (TLS) 1.2 (controller interface)

- Brocade OpenFlow in hybrid port mode with support for sFlow, and IP, and with protected VLAN for additional flexibility

- Up to 32,000 flows supported

Superior high-availability design:

- Redundant management modules

- Redundant switch fabrics

- Redundant power supplies and cooling

system

- Hitless Layer 2/3 failover with stateful OSPF IS-IS and BGP Graceful Restart

- Hitless (in-service) software upgrades with Graceful Restart

Advanced QoS:

- Hierarchical Quality of Service (H-QoS): Supports up to four levels of hierarchy—port, logical port (optional), customer (optional), and service

- Inbound and outbound two-rate three-color traffic policers with accounting

- Eight distinct priority levels

- WRED support for congestion management and precedence dropping (tunable via configuration)

- Support for hybrid queue servicing disciplines: Mixed, Strict Priority, and Weighted Fair Queuing

Comprehensive hardware-based security and policies:

- Layer 2/3 ACLs (both inbound and outbound)

- Granular ACL accounting (both inbound and outbound)

- Hardware-based packet filtering

- Hardware-based Policy-Based Routing (PBR)

- Unicast Reverse Path Forwarding (uRPF)

- IPv4/IPv6 Receive ACLs

- IPv6 ACL–Based Rate Limiting

- ACL Editing

- Port-based network access control using 802.1x or MAC port security

- Root guard and BPDU guard

- Broadcast, multicast, and unknown unicast rate limits

- ARP inspection for static entries

- Multi-port Static ARP and Static MAC

- 256-bit Suite B Algorithm IP-layer encryption

- 128-bit MAC-layer encryption

- Multi-Chassis Trunking with support for up to 512 clients (Active/Active mode or Active/Standby mode for Active/Passive access for client ports)

Full suite of unicast and multicast IPv4 and IPv6 routing protocols:

- Supported IPv4 protocols include RIP, OSPF, BGP-4, IS-IS, PIM-DM, PIM-SM/SSM, IGMP, BGP-MP for multicast, MSDP, Anycast RP, PIM Multicast ECMP, and RPF shortcut

- Supported IPv6 protocols include RIPng, OSPFv3, IS-IS for IPv6, BGP-MP for IPv6 (BGP4+), PIM-SM/SSM, MLD, VRRPv6, IPv6 Non-Stop Routing (NSR), VRRP-E, PIM Multicast ECMP, and RPF shortcut

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* Scalability limits depend on configured system parameters, –DM/-X/-X2 module types, licenses, system profile selected, and routing database complexity.

Brocade MLXe Enterprise Switches At a Glance

Features	MLXe-4	MLXe-8
Interface slots	4	8
Switch fabric capacity	1.92 Tbps	3.84 Tbps
Data forwarding capacity	1.6 Tbps	3.2 Tbps
Packet routing performance	1.6 billion pps	2.38 billion pps
Maximum 100 GbE ports	8	16
Maximum 40 GbE ports	16	32
Maximum 10 GbE ports	96	192
Maximum 1 GbE ports	192	384
Height (inches/rack units)	8.71 in./5RU	12.21 in./7RU
Management module redundancy	1:1	1:1
Switch fabric redundancy	N+1	N+1
Power supply redundancy	1+1	1+1
Airflow	Side to back	Side to back
Maximum DC power consumption (W)	2,083	4,060
Maximum AC power consumption (W) (100–240 VAC)	2,083	4,060
Maximum thermal output (BTU/HR)	7,108	13,858
Dimensions	17.20 in. W × 8.71 in. H × 23.0 in. D (43.69 cm × 22.12 cm × 58.42 cm)	17.20 in. W × 12.21 in. H × 24.0 in. D (43.69 cm × 31.01 cm × 60.96 cm)
Weight	117 lb (53 kg)	171 lb (78 kg)

Brocade MLXe Enterprise Switch Specifications

IEEE Compliance

- 802.3-2005 CSMA/CD Access Method and Physical Layer Specifications
- 802.3ab 1000BASE-T
- 802.3ae 10 Gigabit Ethernet
- 802.3u 100BASE-TX, 100BASE-T4, 100BASE-FX Fast Ethernet at 100 Mbps with Auto-Negotiation
- 802.3x Flow Control
- 802.3z 1000BASE-X Gigabit Ethernet over fiber optic at 1 Gbps
- 802.3ad Link Aggregation
- 802.3ah Ethernet in the First Mile
- 802.1Q Virtual Bridged LANs
- 802.1D MAC Bridges
- 802.1w Rapid STP
- 802.1s Multiple Spanning Trees
- 802.1ad Provider Bridges; partial support: port-based and S-tagged service interface
- 802.1ag Connectivity Fault Management (CFM)
- 8023.ba 100 Gigabit Ethernet
- 802.1ab Link Layer Discovery Protocol
- 802.1ah Provider Backbone Bridging
- 802.1ae MAC Security standard

RFC Compliance

BGPv4	• RFC 1745 OSPF Interactions
	• RFC 1772 Application of BGP in the Internet
	• RFC 1997 Communities and Attributes
	• RFC 2385 BGP Session Protection via TCP MD5
	• RFC 2439 Route Flap Dampening
	• RFC 2918 Route Refresh Capability
	• RFC 3392 Capability Advertisement
	• RFC 3682 Generalized TTL Security Mechanism, for eBGP Session Protection
	• RFC 4271 BGPv4
	• RFC 4273 BGP-4 MIB
	• RFC 4456 Route Reflection
	• RFC 4486 Sub Codes for BGP Cease Notification Message
	• RFC 4724 Graceful Restart Mechanism for BGP
	• RFC 4893 BGP Support for Four-octet AS Number Space
	• RFC 5065 BGP4 Confederations
	• RFC 5291 Outbound Route Filtering Capability for BGP-4
	• RFC 5396 Textual Representation of Autonomous System (AS) Numbers
	• RFC 5668 4-Octect AS specific BGP Extended Community

RFC Compliance (continued)

OSPF	• RFC 2328 OSPF v2
	• RFC 3101 OSPF NSSA
	• RFC 1745 OSPF Interactions
	• RFC 1765 OSPF Database Overflow
	• RFC 1850 OSPF v2 MIB
	• RFC 2154 OSPF with Digital Signature (Password, MD-5)
	• RFC 2370 OSPF Opaque LSA Option
	• RFC 3137 OSPF Stub Router Advertisement
	• RFC 3630 TE Extensions to OSPF v2
	• RFC 3623 Graceful OSPF Restart (helper mode)
	• RFC 4222 Prioritized Treatment of Specific OSPF Version 2
	• RFC 5250 OSPF Opaque LSA option
IS-IS	• RFC 1195 Routing in TCP/IP and Dual Environments
	• RFC 1142 OSI IS-IS Intra-domain Routing Protocol
	• RFC 3277 IS-IS Blackhole Avoidance
	• RFC 5120 IS-IS Multi-Topology Support
	• RFC 5301 Dynamic Host Name Exchange
	• RFC 5302 Domain-wide Prefix Distribution
	• RFC 5303 Three-Way Handshake for IS-IS Point-to-Point
	• RFC 5304 IS-IS Cryptographic Authentication(MD-5)
	• RFC 5306 Restart Signaling for ISIS(helper mode)
RIP	• RFC 1058 RIP v1
	• RFC 2453 RIP v2
	• RFC 1812 RIP Requirements
IPv4 Multicast	• RFC 1122 Host Extensions
	• RFC 1112 IGMP v1
	• RFC 2236 IGMP v2
	• RFC 2362 PIM-SM
	• RFC 3376 IGMP v3
	• RFC 3569 Overview of SSM
	• RFC 3618 MSDP
	• RFC 3973 PIM-DM
	• RFC 4610 Anycast RP using PIM
	• RFC 4611 MSDP Deployment Scenarios
	• RFC 4760 BGP-MP

RFC Compliance (continued)

General Protocols	
	• RFC 768 UDP
	• RFC 791 IP
	• RFC 792 ICMP
	• RFC 793 TCP
	• RFC 826 ARP
	• RFC 854 TELNET
	• RFC 894 IP over Ethernet
	• RFC 903 RARP
	• RFC 906 TFTP Bootstrap
	• RFC 950 Subnet
	• RFC951 BootP
	• RFC 1027 Proxy ARP
	• RFC 1042 Standard for The Transmission of IP
	• RFC 1166 Internet Numbers
	• RFC 1122 Host Extensions for IP Multicasting
	• RFC 1191 Path MTU Discovery
	• RFC 1256 IRDP
	• RFC 1340 Assigned Numbers
	• RFC 1354 IP Forwarding Table MIB
	• RFC 1519 CIDR
	• RFC 1542 BootP Extensions
	• RFC 1591 DNS (client)
	• RFC 1812 Requirements for IPv4 Routers
	• RFC 1858 Security Considerations for IP Fragment Filtering
	• RFC 2131 BootP/DHCP Helper
	• RFC 2578 Structure of Management Information Version 2
	• RFC 2784 Generic Routing Encapsulation
	• RFC 3021 Using 31-Bit Prefixes on IPv4 Point-to-Point Links
	• RFC 3768 VRRP
	• RFC 4001 Textual Conventions for Internet Network Addresses
	• RFC 4950 ICMP Extensions for MPLS
	• RFC 4459 MTU and Fragmentation
QoS	
	• RFC 2474 DiffServ Definition
	• RFC 2475 An Architecture for Differentiated Services
	• RFC 2597 Assured Forwarding PHB Group
	• RFC 2697 Single Rate Three Color Marker
	• RFC 2698 A Two-Rate Three-Color Marker
	• RFC 3246 An Expedited Forwarding PHB

Other	
	• RFC 1354 IP Forwarding MIB
	• RFC 1757 RMON Groups 1, 2, 3, 9
	• RFC 2068 HTTP
	• RFC 2665 Ethernet Interface MIB
	• RFC 2784 Generic Routing Encapsulation (GRE)
	• RFC 2865 RADIUS
	• RFC 2863 Interfaces Group MIB
	• RFC 3176 sFlow
	• RFC 4087 IP Tunnel MIB
	• RFC 4133 Entity MIB
	• RFC 4293 IP MIB
	• RFC SNTP
	• RFC 4741 NETCONF (Partial)
	• RFC 5676 Definitions of Managed Objects for Mapping SYSLOG Messages to SNMP Notifications
	• RFC 5961 TCP Security
	• RFC 5880 Bidirectional Forwarding Detection (BFD)
IPv6 Core	
	• RFC 1887 IPv6 unicast address allocation architecture
	• RFC 1981 IPv6 Path MTU Discovery
	• RFC 2375 IPv6 Multicast Address Assignments
	• RFC 2450 Proposed TLA and NLA Assignment Rules
	• RFC 2460 IPv6 Specification
	• RFC 2462 IPv6 Stateless Address—Auto-Configuration
	• RFC 2464 Transmission of IPv6 over Ethernet Networks
	• RFC 2471 IPv6 Testing Address allocation
	• RFC 2711 IPv6 Router Alert Option
	• RFC 3587 IPv6 Global Unicast—Address Format
	• RFC 4193 Unique Local IPv6 Unicast Addresses
	• RFC 4291 IPv6 Addressing Architecture
	• RFC 4301 IP Security Architecture
	• RFC 4303 Encapsulation Security Payload
	• RFC 4305 ESP and AH cryptography
	• RFC 4443 ICMPv6
	• RFC 4552 Auth for OSPFv3 using AH/ESP
	• RFC 4835 Cryptographic Alg. Req. for ESP
	• RFC 4816 Neighbor Discovery for IP version 6 (IPv6)

RFC Compliance (continued)

IPv6 Routing	• RFC 2080 RIPng for IPv6 • RFC 2740 OSPFv3 for IPv6 • RFC 5308 Routing IPv6 with IS-IS • RFC 2545 Use of BGP-MP for IPv6 • RFC 6106 Support for IPv6 Router Advertisements with DNS Attributes • RFC 6164 Using 127-Bit IPv6 Prefixes on Inter-Router Links
IPv6 Multicast	• RFC 2710 Multicast Listener Discovery (MLD) for IPv6 • RFC 3810 Multicast Listener Discovery Version 2 for IPv6 • RFC 4601 PIM-SM • RFC 4604 IGMPv3 and MLDv2 for SSM • RFC 4607 Source-Specific Multicast for IP
Encryption	• RFC 5996 Internet Key Exchange Protocol Version Version 2 (IKEv2) • RFC 4303 IP Encapsulating Security Payload (ESP) • RFC 6379 Suite B Cryptographic Suites for IPsec • RFC 5903 Elliptic Curve Groups modulo a Prime (ECP Groups) for IKE and IKEv2 • RFC 4868 Using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 with IPsec • RFC 4754 IKE and IKEv2 Authentication Using the Elliptic Curve Digital Signature Algorithm(ECDSA) • RFC 4106 The Use of Galois/Counter Mode (GCM) in IPsec Encapsulating Security Payload (ESP) • RFC 3602 AES with 128-bit keys in CBC mode • RFC 4806 Online Certificate Status Protocol (OCSP) Extensions to IKEv2 • FIPS PUB 186-3 Digital Signature Standard (DSS) • SP800-56A Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography
Federal Certification	• FIPS: FIPS 140-2 Level 2 with Design Assurance for Level 3 • Common Criteria: Network Device Protection Profile version 1.1 • USGv6: UNH-IOL USGv6 accreditation as Switch and Router • JITC: 1. DoD UC APL for Assured Services LAN (ASLAN) Layer 2/3 switch with MPLS 2. DoD UC APL for Customer Edge Router

Network Management

- Brocade Network Advisor Web-based Graphical User Interface (GUI)
- Integrated industry-standard Command Line Interface (CLI)
- sFlow (RFC 3176)
- Telnet
- SNMP v1, v2c, v3
- SNMP MIB II
- RMON
- Support for automated configuration management using NETCONF
- Entity MIB (Version 3)

Element Security Options

- TLS 1.1 and 1.2
- AAA
- RADIUS
- Secure Shell (SSH v2)
- Secure Copy (SCP v2)
- HTTPs
- TACACS/TACACS+
- Username/Password (Challenge and Response)
- Bi-level Access Mode (Standard and EXEC Level)
- Protection against Denial of Service (DoS) attacks, such as TCP SYN or Smurf Attacks

Environmental

- Operating temperature: 0°C to 40°C (32°F to 104°F)
- Storage temperature: -25°C to 70°C (-13°F to 158°F)
- Relative humidity: 5% to 90%, at 40°C (104°F), non-condensing
- Storage humidity: 95% maximum relative humidity, non-condensing
- Operating altitude: 6,600 ft (2,012 m)
- Storage altitude: 15,000 ft (4,500 m) maximum

Safety Agency Approvals

- CAN/CSA-C22.2 No. 60950-1-3
- UL 60950-1
- IEC 60950-1
- EN 60950-1 Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification, Requirements and User's Guide
- EN 60825-2 Safety of Laser Product—Part 2: Safety of Optical Fibre Communication Systems

Electromagnetic Emission

- ICES-003 Electromagnetic Emission
- FCC Class A
- EN 55022/CISPR-22 Class A/VCCI Class A
- AS/NZS 55022
- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuation and Flicker
- EN 61000-6-3 Emission Standard (supersedes EN 50081-1)

Immunity

- EN 61000-6-1 Generic Immunity and Susceptibility (supersedes EN 50082-1)
- EN 55024 Immunity Characteristics. Supersedes:
  — EN 61000-4-2 ESD
  — EN 61000-4-3 Radiated, radio frequency, electromagnetic field
  — EN 61000-4-4 Electrical fast transient
  — EN 61000-4-5 Surge
  — EN 61000-4-6 Conducted disturbances induced by radio-frequency fields
  — EN 61000-4-8 Power frequency magnetic field
  — EN 61000-4-11 Voltage dips and sags

Power and Grounding

- ETS 300 132-1 Equipment Requirements for AC Power Equipment Derived from DC Sources
- ETS 300 132-2 Equipment Requirements for DC Powered Equipment
- ETS 300 253 Facility Requirements

Physical Design and Mounting

Rack mount	19-inch rack mount supporting racks compliant with:
	• ANSI/EIA-310-D
	• ETS 300 119
	• GR-63-CORE Seismic Zone 4
Table top	

Environmental Regulatory Compliance

- EU 2002/95/EC RoHS (with lead exemption)
- EU 2002/96/EC WEEE

Network Equipment Building Standards (NEBS)

- GR-1089-CORE NEBS EMC and Safety
- GR-63 CORE: NEBS Physical Protection
- SR-3580: NEBS Criteria Levels (Level 3)

Brocade MLXe Enterprise Switch Ordering Information

Part Number	Description
BR-MLXE-ENT-4-MR2-M-AC	Brocade MLXe-4 AC system with one MR2 (M) management module, two high-speed switch fabric modules, one 1,800 W AC power supply, four exhaust fan assembly kits, and air filter. Power cord not included.
BR-MLXE-ENT-8-MR2-M-AC	Brocade MLXe-8 AC system with one MR2 (M) management module, two high-speed switch fabric modules, one 1,800 W AC power supply, four exhaust fan assembly kits, and air filter. Power cord not included.
BR-MLX-MR2-M	Brocade MLX system management module, 4 GB SDRAM, 2 GB internal compact flash, external compact flash slot, EIA/TIA-232 and 10/100/1,000 Ethernet ports for out-of-band management
NI-X-4-HSF	Brocade MLX 4-slot system high-speed switch fabric module
NI-X-16-8-HSF	Brocade MLX 8-slot system high-speed switch fabric module
BR-MLX-10GX4-IPSEC-M	Brocade MLX 4-port 10 GbE/1 GbE combo and 4-port 1 GbE (-M) IPsec module with 512,000 IPv4 routes or 240,000 IPv6 routes in hardware
BR-MLX-100GX2-CFP2-M	Brocade MLX 2-port 100 GbE (M) CFP2 module. Supports 512,000 IPv4 routes in FIB.
BR-MLX-100GX2-CFP2-X2	Brocade MLX 2-port 100 GbE (X2) CFP2 module with extended route table support for up to 2.4 million IPv4 or 1.8 million IPv6 routes in hardware
BR-MLX-40Gx4-M	Brocade MLX Series 4-port 40 GbE (M) module with IPv4/IPv6/MPLS hardware support and support for QSFP+ optics, including both LR and SR versions. Supports up to 512,000 IPv4 routes or 128,000 IPv6 routes. Requires high-speed switch fabric modules.
BR-MLX-10GX20-X2	Brocade MLX 20-port 10 GbE/1 GbE (X2) SFP+ and SFP combo module with extended route table support for up to 2.4 million IPv4 or 1.8 million IPv6 routes in hardware. Integrated hardware enabled MACsec.
BR-MLX-10GX20-M	Brocade MLX 20-port 10 GbE/1 GbE (M) combo module. Supports SFP+ and SFP with up to 512,000 IPv4 routes or 256,000 IPv6 routes in FIB. Integrated hardware enabled MACsec.
BR-MLX-10GX24-DM	Brocade MLXe 24-port 10 GbE module with IPv4/IPv6/MPLS hardware support—requires SFP optics. Supports 256,000 IPv4 routes in FIB.
BR-MLX-10Gx8-X	Brocade MLX Series 8-port 10 GbE (X) module with IPv4/IPv6/MPLS hardware support—requires SFP optics. Supports up to 1 million IPv4 routes in FIB. Requires high-speed switch fabric modules.
NI-MLX-10Gx8-M	Brocade MLX Series 8-port 10 GbE (M) module with IPv4/IPv6/MPLS hardware support and up to 512,000 IPv4 routes. Requires SFP+ optics and high-speed switch fabric modules.
NI-MLX-48-T-A	Brocade MLX Series 48-port 10/100/1000BASE-T, MRJ21 module with IPv4/IPv6/MPLS hardware support
BR-MLX-1GFX24-X	Brocade MLX Series 24-port FE/GbE (SFP) module with IPv4/IPv6/MPLS hardware support. Supports 1 million IPv4 routes in hardware.
BR-MLX-1GFX24-X-ML	Brocade MLX Series 24-port FE/GbE (SFP) module with IPv4/IPv6/MPLS hardware support. Supports 512,000 IPv4 routes in FIB. License upgradable to "X" scalability (1 million IPv4 routes in hardware).
BR-MLX-1GCX24-X	Brocade MLX 24-port (X) 10/100/1,000 copper (RJ-45) module with IPv4/IPv6/MPLS hardware support. Supports 1 million IPv4 routes in hardware.
BR-MLX-1GCX24-X-ML	Brocade MLX 24-port (X) 10/100/1,000 copper (RJ-45) module with IPv4/IPv6/MPLS hardware support. Supports 512,000 IPv4 routes in FIB. License upgradable to "X" scalability (1 million IPv4 routes in hardware).
BR-MLX-1GX20-U10G-M	Brocade MLX 20-port 1 GbE (M) module. Upgradable to 10 GbE using additional software license. Supports SFP with up to 512,000 IPv4 routes or 240,000 IPv6 routes in hardware.
BR-MLX-1GX20-U10G-MUPG	Brocade MLX 20-port license to upgrade from 1 GbE to 10 GbE (M).

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