HIGH-PERFORMANCE DATA CENTER ROUTING SOLUTIONS

BROCADE MLX SERIES

Multiservice IP/MPLS Routers

HIGHLIGHTS

- 4-, 8-, 16-, and 32-slot IPv4/IPv6/MPLS/VRF-enabled core routers
- Industry-leading port density—up to 32 100 Gigabit Ethernet (GbE), 128 40 GbE, 768 10 GbE, or 1536 1 GbE ports in a single chassis
- Fully distributed, non-blocking architecture with up to 15.36 Tbps switching fabric capacity and 9.5 Bpps throughput
- High-availability design offering Multi-Chassis Trunking (MCT), hitless failover, stateful OSPF redundancy, graceful BGP and OSFP restarts, hitless software upgrades, and redundant hardware for management modules, switch fabrics, power supplies, and fans
- High-capacity terabit link aggregation for on-demand support of high-bandwidth services
- Integrated support for OpenFlow in true hybrid-port mode, enabling Software-Defined Networking (SDN) for programmatic control of the network
- Ideal for a wide range of advanced applications in cloud environments, large data centers, large-enterprise cores, hosting providers, and High-Performance Computing (HPC) environments

Today's network planners require solutions that provide the right mix of functionality without impacting performance while reducing Total Cost of Ownership (TCO). In addition, a solid, future-proof network design must be able to handle the rapid pace of technological change. The increasing role of the converged network makes high availability and Quality of Service (QoS) crucial to the success of many of today's deployments. When selecting equipment, planners also need to be confident that they can enable advanced features without purchasing additional hardware or software.

The Brocade® MLX® Series of routers is designed to meet all these requirements and more. Built with a state-of-the-art, sixth-generation, network processor-based architecture and terabit-scale switch fabrics, the Brocade MLX Series provides a rich set of high-performance IPv4, IPv6, Multiprotocol Label Switching (MPLS), and Multi-VRF capabilities as well as advanced Layer 2 switching capabilities. As a result, these routers address the diverse needs of environments ranging from data centers to large enterprises, government networks, education/research, High-Performance Computing (HPC), Metro Ethernet networks, and cloud service providers.

The Brocade MLX Series includes the Brocade MLXe Core Routers, available in 4-slot, 8-slot, 16-slot, and 32-slot systems. The Brocade MLXe delivers industry-leading wire-speed performance, port capacity, and density with up to 9.5 Bpps, 32 100 Gigabit Ethernet (GbE), 128 40 GbE, 768 10 GbE, or 1536 1 GbE ports in a single system.

Designed to enable reliable converged infrastructures and support mission-critical applications, the Brocade MLX Series features advanced redundant switch fabric architecture for very high availability. The architecture ensures 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 in a graceful degradation mode in which 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 Multi-Service IronWare® operating system, powering the Brocade MLX Series, offers hitless management failover with OSPF and IP multicast non-stop routing, BGP graceful restart capabilities, as well as hitless (in-service) software upgrades to further enhance both system availability and overall network availability. The Multi-Chassis Trunking (MCT) feature allows all links to remain active and forward traffic, and provides instantaneous link or node failover.

In addition to providing best-in-class performance and reliability, the Brocade MLX Series delivers superior efficiency, helping to reduce TCO. Each router has the lowest power consumption and heat dissipation in its class and provides significant space savings through leading density and a small form factor. These unique aspects help reduce power, cooling, and rack space costs, thereby lowering overall operating expenditures.

ADVANCED CAPABILITIES FOR A WIDE RANGE OF APPLICATIONS

The Brocade MLX Series provides a wide range of capabilities to support advanced applications and services in the most demanding network environments.

High-Performance Data Center Core Router

Today's data center networks are critical to the ongoing operations of an organization. Network infrastructure deployed in the data center needs to have high density, high performance, scalability, and exceptional resiliency to ensure uninterrupted connectivity to mission-critical applications. The Brocade MLX Series addresses all these needs in a flexible architecture that is designed to scale from the edge to the core.

As shown in Figure 1, the Brocade MLX Series provides a high-performance and scalable core router, and can aggregate up to 768 10 GbE wire-speed links in a single chassis. These routers provide self-healing topologies in Layer 2 using Brocade MCT, which enables network design simplicity and fast link or node failover without the use of Spanning Tree Protocol (STP). At the same time, the Brocade MLX Series supports a range of industry-standard protocols, including STP, Rapid Spanning Tree Protocol (RSTP), per VLAN STP (PVST+), and Multiple Spanning Tree Protocol (MSTP).

The Brocade MLX Series offers unique scalability for Layer 2 applications with a capacity of up to two million MAC addresses per system. Complementing the Layer 2 capabilities is a powerful set of advanced Layer 3 capabilities and services, including:

- Support for scalable EGP and IGP routing protocols (BGPv4, OSPF, IS-IS, PBR)
- IPv4 and IPv6
- A comprehensive multicast feature set (PIM and IGMP)
- Support for resiliency protocols such as VRRP and VRRPE
- A powerful suite of MPLS capabilities and services, including MPLS-TE, Fast ReRoute (FRR), MPLS Virtual Leased Line (VLL), Virtual Private LAN Service (VPLS), and BGP/MPLS VPNs (MPLS Layer 3 VPNs)

This unique combination of Layer 2 features and advanced MPLS features in a single router provides seamless data center-to-metro connectivity.

The Brocade MLX Series also supports virtual routing via Multi-VRF. As a result, enterprises can create multiple security zones and simplified VPNs for their different applications and business units, while streamlining overall network management.

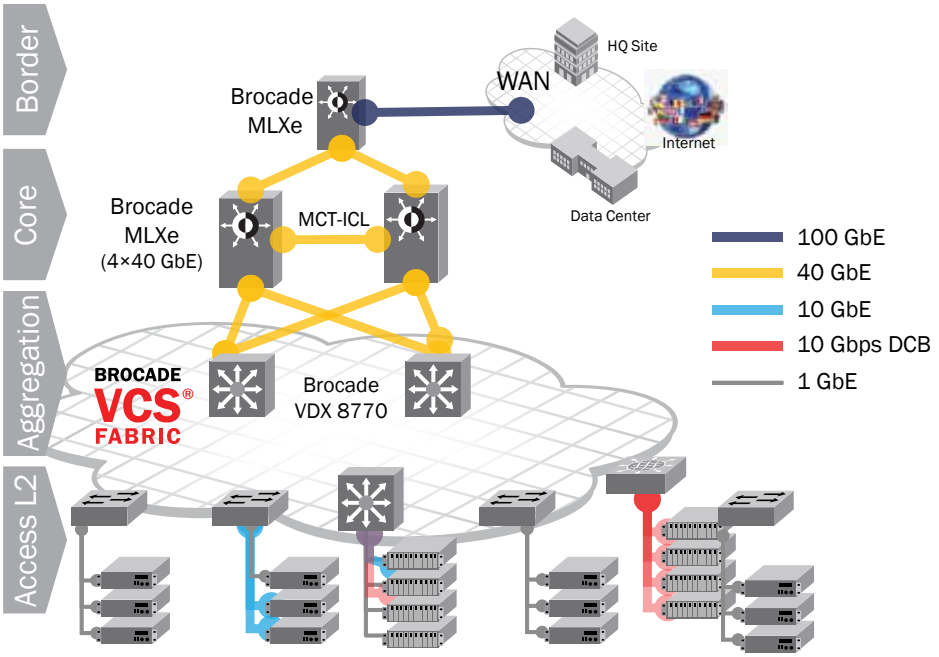


Figure 1.
High-performance data center core router.

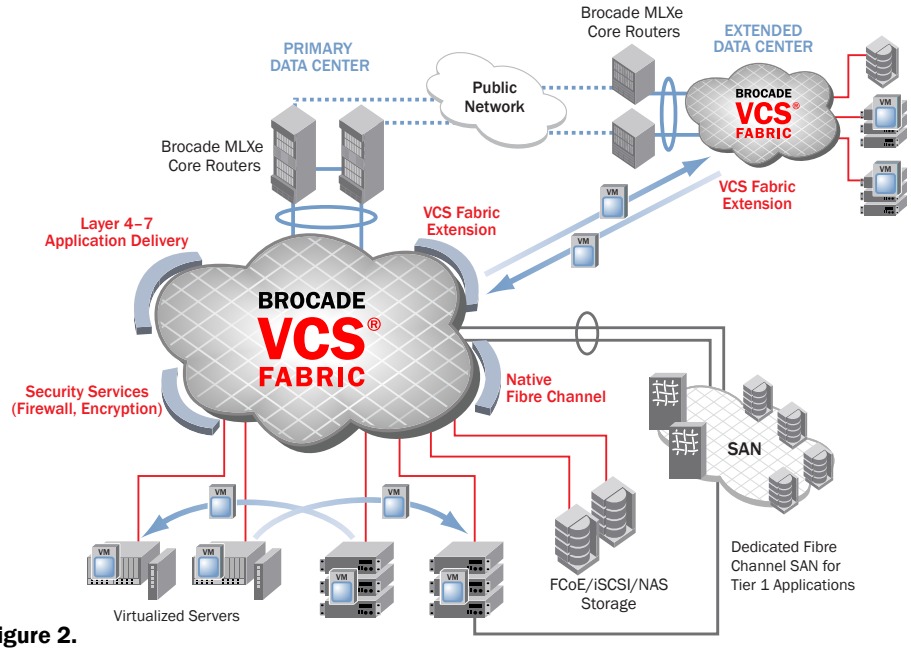


Figure 2.
End-to-end, scalable, and resilient data center architecture.

Simplified, Scalable, and Resilient Data Center Architecture

The skyrocketing growth in data, virtualization, and cloud IT services is creating demand for a network infrastructure that is resilient, scalable, and simple to manage. The Brocade MLX Series provides the investment protection and future-proofing to build such infrastructures. As shown in Figure 2, organizations can utilize the Brocade MLX Series along with Brocade VDX® switches at the aggregation and access layers to build a complete end-to-end data center architecture that meets their needs. Brocade networking solutions interconnect all resources within the data center—from the server to storage to the WAN connection—providing best-in-class automation, efficiency, scalability/performance, and agility. Brocade network management solutions and support for leading cloud orchestration tools also span the entire portfolio, unifying and simplifying the administrative experience.

Enabling Programmatic Control of the Network

Software-Defined Networking (SDN) is a powerful new network paradigm designed for the world's most demanding networking environments and promises breakthrough levels of customization, scale, and efficiency. The Brocade MLX Series enables SDN by supporting the OpenFlow protocol, which allows communication between an OpenFlow controller and an OpenFlow-enabled router. Using this approach, organizations can control their networks programmatically, transforming the network into a platform for innovation through new network applications and services.

The Brocade MLX Series delivers OpenFlow in true hybrid-port mode. With Brocade hybrid-port mode, organizations can simultaneously deploy traditional routing with OpenFlow on the same port. This unique capability provides a pragmatic path to SDN by enabling network operators to integrate OpenFlow into existing networks, giving them the programmatic control offered by SDN for specific flows while the remaining traffic is routed as before. Brocade hardware support for OpenFlow enables organizations to apply these capabilities at line rate in 10 GbE, 40 GbE, and 100 GbE networks.

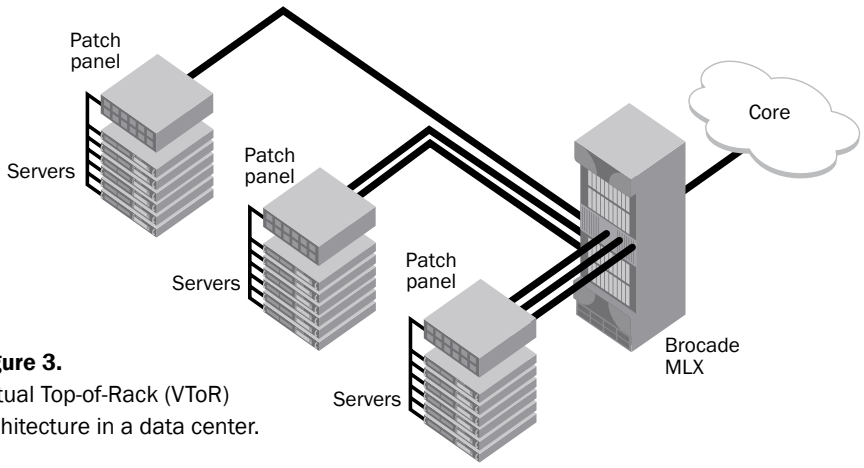


Figure 3.
Virtual Top-of-Rack (VToR) architecture in a data center.

Virtual Top-of-Rack Architecture in a Data Center

At the access layer of the network, the Brocade MLX Series is deployed in a middle-of-row or end-of-row architecture and can be directly connected to up to 1536 servers in a single chassis. Figure 3 shows the Brocade MLX Series 48-T-A module in an end-of-row Virtual Top-of-Rack (VToR) architecture. The servers connect at the top of the rack to a passive patch panel (VToR) using RJ45 connectors, while the VToR is connected to the router via MRJ21 connectors. The MRJ21 cables can be dual-homed to two Brocade MLX Series chassis in active-active Layer2/3 using MCT to deliver higher resiliency and performance in a simplified architecture.

This architecture combines the access and aggregation layers, and helps improve performance by decreasing latency due to a reduced number of hops. It also helps lower capital expenditures by reducing the number of devices and cables needed, and helps lower operating expenses by simplifying management and increasing availability. Finally, organizations can extend Layer 3 functionality, including Multi-VRF and MPLS, all the way to the edge.

High-Performance Cluster Computing

For large-scale, high-performance, low-latency cluster computing, superior 10 GbE, 40 GbE, and 100 GbE port densities are vital. These clusters, as shown in Figure 4, constitute the backbone of many leading-edge applications such as advanced simulation, motion-picture special effects, and large-scale data acquisition in physics research facilities.

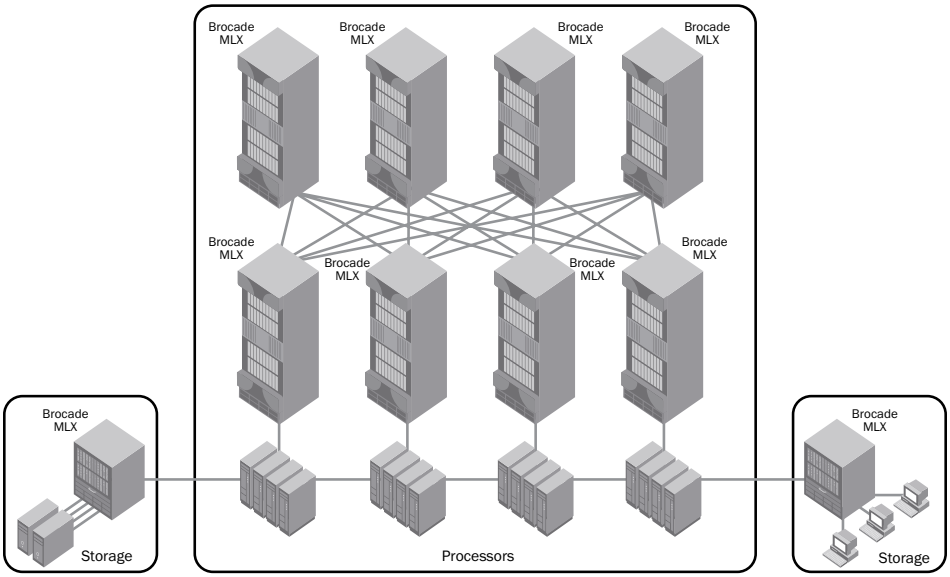
The state-of-the-art Clos switch fabric architecture in the Brocade MLX Series provides ample capacity for bandwidth-intensive applications. By combining superior data capacity with ultra-low latency, the Brocade MLX Series accelerates application performance in HPC clusters, thereby increasing processing power and productivity.

Using MPLS to Connect Data Centers

Today's organizations must be able to ensure high availability between geographically dispersed data centers and migrate virtual machines between data centers. These requirements are driving the need to extend Layer 2 VLANs across the WAN. To meet this need, the Brocade MLX Series offers point-to-point Layer 2 MPLS VPNs (Virtual Leased Lines, or VLLs), multipoint Layer 2 MPLS VPNs (Virtual Private LAN Service, or VPLS), and routing over VPLS.

Both solutions offer a viable alternative for organizations that are averse to deploying loop-mitigating protocols (such as RSTP or MSTP) across large Layer 2 domains. In addition, these low-latency, highly resilient solutions are based on proven standards and help provide significant cost savings while meeting the requirements of connecting geographically dispersed data centers.

Figure 4.
High-performance cluster computing.



SIMPLIFIED NETWORK MANAGEMENT

The Brocade MLX Series leverages Brocade Network Advisor, an application that offers comprehensive unified network management for all Brocade products. Brocade Network Advisor provides easy-to-use MPLS Manager, which can help to configure, monitor, and manage VPLS and Virtual Leased Line (VLL) services across networks. Brocade Network Advisor also uses sFlow-based technology to provide proactive monitoring, traffic analysis, and reporting, helping to reduce network downtime. In addition, Brocade Network Advisor offers administrators end-to-end network visibility from a single dashboard.

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.

ABOUT BROCADE

Brocade is the pure-play networking company that innovates to make high-performance networks easier to deploy, manage, and scale in the most demanding environments. Through industry-leading technology, unmatched expertise, and strategic partnerships, Brocade delivers resilient networks that increase agility and efficiency while helping organizations stay ahead of change. Learn more at www.brocade.com.

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