

THE HIGH-PERFORMANCE DATA CENTER

Juniper Networks and VMware Optimize the Data Center

Challenge

Design next generation data centers to support business agility in the most cost-efficient manner. Reduce data center CAPEX and OPEX, while simultaneously ensuring high-availability, scalability, and application performance and visibility across both network and server infrastructures.

Solution

VMware vSphere and Juniper Networks EX Series Ethernet Switches are architected for next generation data centers, enabling customers to quickly adapt to new business opportunities in the most cost-efficient way.

Benefits

- Reduced operational complexity
- Consolidated network and server infrastructure
- Increased performance, scalability and security
- Lower power, space and cooling costs

Juniper Networks® provides data center networking solutions to leading organizations ranging from large scale global enterprises to regional and global service providers. Juniper Networks Data Center Infrastructure Solutions provide significant benefits to organizations looking to simplify, consolidate, and accelerate performance within their data centers, while at the same time lowering costs. Juniper Networks Data Center Infrastructure Solutions combined with VMware's server virtualization solutions reduces the total cost of data center ownership by introducing new and innovative architectures.

The architectural innovations delivered via a partnership between Juniper Networks and VMware provide a high-performance product portfolio to enable server virtualization with improved performance and availability. The Juniper Networks portfolio of routing, switching, and security products use a single network operating system—Juniper Networks JUNOS® Software—and is managed by a single network management system. VMware's hypervisor and VMotion enable cost savings with server performance and availability gains in the data center. The improved simplicity, agility, and efficiency provided through Juniper Networks and VMware working together enable the benefits of virtual server environments with network performance improvements to address the new demands placed upon the data center network.

The Challenge

The traditional data center has become overly complex, costly, and extremely inefficient. Server virtualization is significantly changing the rules of data center design. Network performance requirements such as throughput, low latency, quality of services, and availability have become increasingly important in environments where server virtualization is introduced. To meet the growing demands of server virtualization, the data center network should be virtualized as well to bring greater flexibility and added redundancy to the network infrastructure. Without taking steps to support higher virtual machine densities, organizations put their server virtualization initiatives at risk, and this can ultimately impact application availability and the ability to optimize data center hosted application performance.

Data center architects are clearly embracing the server virtualization trend, as more and more applications and operating systems are virtualized in a production environment. More than one-third of enterprise IT organizations has implemented x86 server virtualization and nearly two-thirds expect to do so by 2009, according to 2008 Forrester Research. IT departments that have already embarked on such a strategy have virtualized 24 percent of servers, and that number is expected to grow by 45 percent by 2009. Clearly, there are significant cost and asset utilization benefits driving these trends.

Juniper Networks and VMware Solution Portfolio for the Data Center

As the network evolves from the physical to the virtual, the conventional architectures for access and core still apply; however, the fundamental difference is that a single physical server acts and operates as if it were multiple separate servers hosting a variety of applications with VMware ESX hypervisor software. What's needed is a flexible and virtualized network environment that can deliver performance at scale, support high availability requirements, and support the greater densities of virtual server identities enabled by VMware and the intensified demand for security services.

Widespread deployment of virtual machines can stress and overwhelm data center infrastructures designed for the old "one server per application" model. And the number of virtual machines in the data center can quickly scale with VMware server virtualization software to meet growing and changing business demands. However, the underlying network infrastructure must be capable of handling a dense virtual machine environment, providing logical port scalability and maintaining deterministic performance, security, availability, and manageability. Similarly, the data center must be capable of supporting high virtual machine density and virtual machine mobility without compromising segmentation to support business requirements such as information security and regulatory compliance. The Juniper and VMware alliance delivers solutions that allow organizations to implement their server, desktop, and application virtualization strategies, while at the same time enhancing the underlying infrastructure's availability and stability, security, policy compliance, and manageability.

Features and Benefits

Increased Demands on Data Center Network Scalability

Virtual servers, now concentrated in the data center, service many endpoints throughout a distributed enterprise. Virtualization significantly increases the scale of traffic coming into the data center from a similar number of distributed clients and virtual desktops. Each Juniper Networks EX4200 Ethernet Switch has an integrated ASIC-based Packet Forwarding Engine, while an integrated Routing Engine delivers control plane functionality. Packet switching capabilities range up to 136 Gbps with layer 2 throughput at wire speed to support these increased demands.

Increased High Availability Requirements

By moving the sprawl of physical servers out of regional offices and consolidating them onto fewer, more powerful virtual servers in data centers with VMware, organizations can improve application availability and security while greatly lowering the cost of operating and maintaining their server infrastructure. But an unintended consequence of fewer, bigger servers is that if the virtual server—or the network connection to the server—experiences performance degradation or downtime, the ability to conduct business can be severely impacted. EX4200 switches offer high availability features such as redundant, hot-swappable internal power supplies, and field-replaceable, multi-blower fan trays to ensure maximum uptime.

Increased Density of Server Identities

VMware server virtualization breaks the old "one server, one MAC address, one IP address" limitations. As server densities grow from 4:1 virtual to physical servers to 10:1 or more, the number of media access control (MAC) and IP addresses significantly increases. Juniper Networks EX4200 Ethernet Switch supports up to 24,000 MAC addresses, up to 16,000 Address Resolution Protocol (ARP) entries, and 12,000 IPv4 unicast routes/2,000 IPv4 multicast routes in hardware to meet the increasing requirements for virtual server environments.

Increased Demands for Quality of Service

EX4200 Ethernet Switches deliver the rich quality of service that is necessary to support fast-growing VMware virtual server environments. EX4200 switches can maintain multi-level, end-to-end traffic prioritizations, with each port supporting up to eight quality-of-service (QoS) queues. A specific virtual machine can be assigned to a specific priority queue, and all packets from the virtual machine can be tagged using class-of-service (CoS) DiffServ Code Point Alias, which is respected throughout the network. Furthermore, EX4200 switches can limit traffic by the specific session that's coming in through a port, which can localize the impact of a denial of service (DoS) attack. Juniper Networks EX Series Ethernet Switches also deliver greater flexibility for storage area networks. A virtualized iSCSI environment is managed through separate VLANs; with EX Series switches, a virtualized iSCSI can be handled either over the same or different network interface cards (NICs), but treated with a different priority queue over the network.

Facilitate NIC Teaming for Enhanced Availability

VMware enhances availability and bandwidth by using NIC teaming when connecting servers to the physical network. In a typical deployment, a VMware server can have two NICs, which connect to two top-of-rack switches, each of which connect to an aggregation switch. If an uplink or switch goes down, traffic will fail over to the other switch. However, if the switch doesn't fail but the upstream link does, an issue can arise where traffic will not automatically fail over. In such situations, EX Series switches can address this problem with a simple JUNOScript that can be used to shut down a port proactively and force the NIC to use the other redundant interface. If an EX Series switch does not see an uplink in the top-of-rack switches, it will automatically bring the link down and force the server to connect to the other switch.

Increased Flexibility to Support VMware VMotion Machine Migration

With VMware VMotion, IT can move workloads to other virtual servers to automatically optimize virtual machines within resource pools, perform hardware maintenance without disrupting business operations, and proactively move virtual machines away from failing or underperforming servers. However, VMotion software requires that both physical machines be in the same Layer 2 domain, in a concept called Layer 2 adjacency. EX4200 switches with Virtual Chassis technology can support VMotion within a Virtual Chassis connected by proprietary Virtual Chassis cabling, as well as by using 10-Gigabit Ethernet fiber to extend the Virtual Chassis topology up to 40 KM in distance, effectively providing IT managers with greater flexibility when managing workloads.

Simplified Management and Operations

EX Series Ethernet Switches dramatically simplify network operations in a virtual network. With Virtual Chassis technology, up to 10 interconnected EX4200 switches can be managed as a single device. Each Virtual Chassis group uses a single JUNOS Software image file and a single configuration file, which reduces the overall monitoring and management overhead. Administrators can also configure ports with security, QoS, and other parameters based on the type of device connected to the port.

Summary—Networking for the Next-Generation Data Center

VMware server virtualization solutions provide the next-generation data center with improved server utilization and significant cost savings. Juniper Networks Data Center Infrastructure Solutions deliver significant benefits to the next-generation data center by simplifying the network, collapsing tiers, and consolidating security services. This network architecture delivers operational simplicity, agility, and greater efficiency to the data center. Applications and service deployments are accelerated, enabling greater productivity with less cost and complexity. The architecture addresses the needs of today's organizations as they leverage the network and business applications with:

- Extremely high network performance to support virtual server environments, demanding applications, and increasing numbers of remote and onsite users
- Scalability and flexibility to grow and adapt to consolidated data centers, supported by full life cycle management capabilities
- Management and visibility across the data center network infrastructure with the ability to provision services on demand and address potential problems as they occur
- Significant cost savings as a result of a simpler architecture with less equipment, space, power, and cooling requirements and easier administration, maintenance, and increased scale

Juniper Networks infrastructure solutions provide a network infrastructure foundation for the next-generation data center with VMware virtual server environments, helping companies to achieve success in fast-changing business environments. With this architecture, organizations can focus on improving the business—whether this requires deploying new applications, entering new markets, or expanding a product portfolio—with a data center infrastructure that can support business growth and unexpected demands without adding significant complexity and expense.

Next Steps

To learn how to optimize your data center with the Juniper Networks and VMware high-performance data center solution, please contact your Juniper Networks or VMware representative.

About VMware

VMware is the global leader in virtualization solutions from the desktop to the datacenter. Customers of all sizes rely on VMware to reduce capital and operating expenses, ensure business continuity, strengthen security and go green. With 2008 revenues of \$1.9 billion, more than 130,000 customers and more than 22,000 partners, VMware is one of the fastest growing public software companies. Headquartered in Palo Alto, California, VMware is majority owned by EMC Corporation (NYSE: EMC). For more information, visit www.vmware.com

About Juniper Networks

Juniper Networks, Inc. is the leader in high-performance networking. Juniper offers a high-performance network infrastructure that creates a responsive and trusted environment for accelerating the deployment of services and applications over a single network. This fuels high-performance businesses. Additional information can be found at www.juniper.net.

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