

# Juniper Networks Data Center Infrastructure Solutions

## A Simplified Data Center for the High-Performance Enterprise

### Challenge

Data centers are complex environments with high cost of operations and extremely demanding application, network and security performance requirements. Each new technical challenge typically requires new purpose-limited hardware with additional cost, management, complexity and introduces a new set of challenges.

### Solution

Simplify the data center with Juniper Networks Data Center Infrastructure Solutions to reduce network tiers, complexity, and associated capital and operational cost while improving scale, reliability and application performance.

### Juniper Benefits

- Network tiers in the data center are collapsed to reduce cost and complexity.
- A common management system simplifies data center network management.
- Data center power, cooling and space requirements are significantly reduced.
- Juniper gives you a choice and flexibility in how you design, deploy and operate the data center.

Juniper Networks has fundamentally changed the data center with innovative technologies to simplify and reduce cost. Juniper Networks Data Center Infrastructure Solutions extend virtualization benefits to the network and collapse network tiers while accelerating application performance, improving security and ensuring availability for the high-performance enterprise. These solutions segment the data center into five purpose-built network tiers where each tier is designed to be best-in-class and functions in concert with the other data center tiers to provide optimal performance. This new architecture incorporates newly available technologies and best practices to optimize performance and reduce today's complexity of the data center.

Juniper solutions are contrary to most approaches in that they recommend a reduction in data center equipment while improving performance with less space, power, cooling and greater operational efficiencies. The design saves businesses that operate data centers in terms of provisioning and management of services and allows for a more environmentally friendly data center. Through Juniper Networks JUNOS™ software and Juniper advancements in network management and Security Threat Response Manager (STRM), relative and accurate visibility of network events is provided and data center operations are greatly simplified with a single management view across the data center.

### The Challenge

Create a data center that meets the high-performance, security, scale and availability requirements of your business while displacing the complexity with operational simplicity. Open standards must be supported to enable the flexibility to adopt future data center innovations without costly proprietary modifications. Furthermore, the data center should support environmentally friendly networking initiatives with reduced space, power and cooling requirements.

### The Data Center Architecture Solution

Juniper solutions define five discrete tiers. Each tier is designed for purpose-built functionality to provide optimal performance, security and high availability. The tiered architecture supports a simplified data center and allows for a migration to the desired scale, performance and security with management, visibility and access control across the enterprise. Recent and proven technology innovations are integrated into the architecture and include WAN acceleration, virtualization, and coordinated threat control among network devices to secure, protect, ensure availability and accelerate application performance. The five data center tiers in this revolutionary architecture include:

- **Application and Data Services** – contains application servers and network storage
- **Core Network** – interconnects all tiers within and across data centers
- **Data Center Backbone** – provides connectivity between primary and backup data center facilities for High Availability (HA), backup and disaster recovery

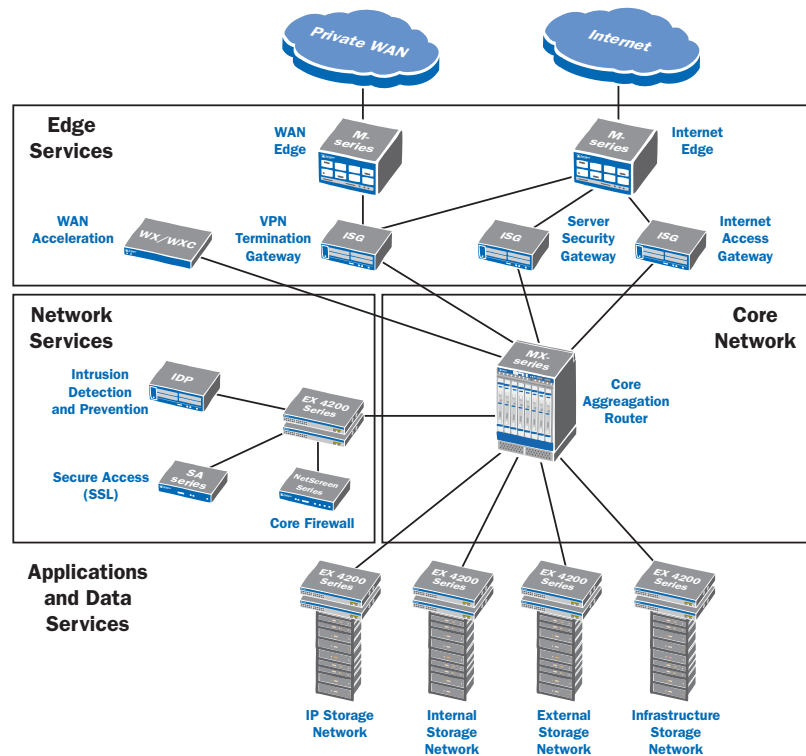


Figure 1: Juniper Networks Data Center Architecture

- **Edge Services** – host all WAN services connecting to non-data center locations and remote users
- **Network Services** – supports network visibility and security to properly manage and protect the data center

### Application and Data Services Tier

The application and data services tier includes servers, storage and applications. The fundamental reason for having a data center is to make sure that the applications, storage and services in this tier are available, secure and protected with disaster recovery options for a large user community. This tier is not the highest capacity in terms of network throughput, however, it is the highest capacity in terms of processing power to support centralized applications and storage. Server virtualization is leveraged to improve utilization rates and to minimize cost associated with servers in the data center. Ensuring HA, Juniper Networks EX-series Ethernet switches with virtual chassis configurations are deployed as “top-of-rack” switches to interconnect servers. Switch virtualization makes multiple switches appear and operate as one switch to simplify management and provide HA with reduced complexity.

The Juniper Networks EX 4200 virtual chassis is recommended and offers several advantages when deployed as a “top-of-rack” solution in the application and data services tier. The EX 4200 virtual chassis provides the necessary performance with 48 10/100/1000BASE-T/TX interfaces at 1 Gbps wire rate per interface. Uplink interfaces are wire rate with up to four GbE or two 10 GbE uplink modules for interconnecting from “top-of-rack” to the data center core. Using the virtual chassis functionality, the number of managed network devices can be reduced by a factor of 10, significantly reducing expensive network equipment and simplifying operations and associated cost. Furthermore, and most importantly, the virtual chassis configuration significantly reduces the number of uplinks and ports used in the aggregation layer of the core network. This reduction of ports in the aggregation layer offers significant cost-saving advantages.

### Core Network Tier

The core network is purpose built to provide high-performance connectivity and extremely fast forwarding of total aggregate traffic at line rate. The core network can span multiple locations and connects the application and data services tier to the network services, edge services and

data center backbone tiers. A logical connection from the core network to all other data center tiers is key in offering a rack location agnostic server-to-network binding to support a virtualized data center that enables automatic repurposing of processing power for connectivity failures and disaster recovery options.

Juniper recommends a two-layer aggregation network model as opposed to the conventional three-layer aggregation network model in the core network tier. We're able to propose such a model given the inherent scalability of Juniper platforms. Each data center tier is given a separate routing instance (Virtual Route Forwarding - VRF) in the core network. Security service virtualization is used to consolidate multiple security functions into converged platforms. Line-rate performance with active security features is provided with end-to-end quality of service (QoS) using VLANs or a combination of VLANs and MPLS. The core is configured with HA and fully redundant Juniper Networks MX-series switches. The MX-series switches meet the requirement of providing extremely fast transport and logically connecting multiple tiers in the data center with required availability and reliability. Juniper award-winning JUNOS software ensures that network core demands are met with scale and operational efficiency.

### Data Center Backbone

The data center backbone is a high-capacity network connecting primary and backup data center facilities. The backbone supports data replication for continued operations in the event of unexpected disasters affecting the primary data center or WAN and remote access to the primary data center. Four key elements of the data center backbone include:

- Optical transport
- Network virtualization technology to interconnect data centers with security and QoS
- IP-level availability/resilience scheme
- Global Load Server Balancing (GLSB)

These four key elements of the data center backbone combine to deliver capabilities that include: 1) data replication to support application clustering and compliance, 2) data backup and restore services, 3) reach to location-specific services using fast and secure connectivity supporting service-oriented architecture (SOA) applications, and 4) legacy clustering technology support.

### Edge Services Tier

The edge services tier aggregates access to the data center, and provides WAN access, VPN termination and WAN application acceleration. Integrated Services Gateway (ISG) firewalls provide border security gateway functionality for segmented internal users, external users, and Internet access traffic with stateful firewall policies and content inspection. Internet routing isolation is provided in the edge services tier to separate exterior routing protocols from interior routing protocols. network address translation (NAT) is used to convert private IP addresses to public Internet routable IP addresses. IPSec VPN tunnel termination for small office and partner locations is supported in the edge services tier. QoS, based upon application, user, device and network, can be set for optimal application performance and user experience. Application-level gateways (ALGs) may be implemented to support applications that have difficulty in navigating standard firewalls.

Juniper recommends an "unconventional" routed connectivity solution (instead of switched) in the edge services tier. Failure detection and correction are placed in the routing domain to provide more efficient and intelligent use of network resources. This design consideration eliminates racks of Ethernet switches and associated equipment cost, space and power consumption to provide additional savings beyond what would normally be achievable.

### Network Tier

The network tier includes IDP for the data center and Secure Access (SA) SSL VPN for data center remote access. The data center core firewall resides in the network tier to protect and secure the high-capacity data center. STRM provides event visibility with templates to support SOX, PCI and other common business compliance requirements. EX-series switches interconnect the Network Tier equipment and provide connectivity to the data center core. Application front end (AFE) services are deployed in this tier to scale data center services without a corresponding increase in equipment, space, power and cooling requirements.

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### Features and Benefits

Given Juniper Networks' innovative solutions, we have redesigned the data center to improve reliability, availability and application performance along with security protection and additional support for common business compliance requirements. Remarkably, this is achieved with the reduction of equipment, space, power and cooling to realize tremendous savings potential and a more environmentally friendly data center without conventional trade-offs. Top benefits of this architecture include:

- Less equipment, space, power and cooling requirements in the data center
- Improved data center protection and security in terms of network protection, connectivity failures and disaster recovery
- Greater simplicity with a flattened network and streamlined provisioning and management
- Significant cost savings over traditional data center architectures

### Solution Components

Table 1: Platform Components of the Data Center Architecture

Infrastructure		Services			Policy and Management
Routing	Switching	Security/VPN	Secure Access	WAN Optimization	Policy and Management
MX960	EX 3200	ISG 1000*	SA 6500	WXC 500 Stack	IC 4000
M320	EX 4200	ISG 2000*			IC 6000
M120		NetScreen-5400			NSM
M10i		NetScreen-5200			CMS
					OAC
					SBR

\*with IDP module

### Summary – The Simplified and Operationally Efficient Data Center

Juniper Networks has taken a completely new and innovative approach to the data center, given proven technology-based options. The technologies and products that Juniper has delivered support this new approach to completely redesign and eliminate traditional data center limitations. The data center architecture removes costly network tiers, virtualizes security within the switch and adds operational efficiency with improved performance and protection.

### Next Steps

The data center architecture from Juniper Networks simplifies the data center, removes network tiers, virtualizes network and security services, and ensures high availability and scale with less cost. Don't continue to throw money and resources away with a legacy data center architecture that underperforms. Contact Juniper to see how you can cost effectively migrate your data center to this radically improved architecture to realize significant cost and performance benefits.

### 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](http://www.juniper.net).

To purchase Juniper Networks solutions, please contact your Juniper Networks sales representative at 1-866-298-6428 or authorized reseller.

