

# INFRASTRUCTURE FOR ENTERPRISE DATA CENTERS

Juniper’s enterprise data center network solution simplifies the network to support efficiency and cost cutting initiatives

### Challenge

With changes in application architectures and increasing popularity of virtualization technologies, dependence on the network is ever increasing. Today’s network needs to be on par with the flexibility of the compute infrastructure and able to scale to support needed application and virtualization capabilities.

### Solution

Juniper offers a future proof data center infrastructure ideally suited for the ever changing demands of business and IT. This solution supports a few hundred to tens of thousands of servers connected through a fully redundant, Spanning Tree Protocol-free data center network infrastructure.

### Benefits

- 10GbE access-based modular network design
- Full Junos OS-based instrumentation for automation
- Very large capacity with minimal LAN networking tiers
- Application-level security inspection and enforcement
- Fully integrated edge connectivity with MPLS support

With the emergence of server virtualization cloud computing, and with more servers being consolidated into fewer data centers, data centers are playing a more critical role than ever in today’s enterprises. Businesses are automating as many organizational processes as possible; IT departments are faced with very tight budgets and many new applications; and platform technologies present large challenges to the networking teams. Additionally, organizations are researching the best ways to offload IT services to cloud providers in order to enjoy the benefits of cloud computing.

### The Challenge

These challenges impose a new set of requirements on the network. From the end user perspective, the high availability and performance attributes of the network and compute infrastructure represent the work environment experience, and these are easy to understand in terms of network requirements. At the same time, businesses are placing new requirements on the network in order to support new emerging operational models. To name a few examples, workloads in the enterprise IT environment are expected to migrate across data center locations, making it necessary to adjust allocation of resources to specific workloads accordingly. And the network needs to both support the process of changing workload distribution and deliver the new workloads to applications. Security functionality needs to be able to work on a per application and per business basis, and as such, needs advanced segmentation and policy capabilities. And then there is the need to seamlessly support applications running across multiple sites, retaining the same security settings across sites, and maintaining L2 connectivity between nodes across sites.

Organizations that seek to support the latest enterprise application and platform technologies are required to build a complex network using a variety of technologies in order to support the requirements of the compute infrastructure. At scale, this complexity becomes a huge problem. Supporting server virtualization, mashup applications, and the integration of public cloud services into a hybrid cloud model involves a variety of technical challenges that are hard to meet at the network level. Typically, the compute infrastructure comprises a set of elements involving the platform (such as Web services, J2EE, or server virtualization), the compute power (e.g., x86 servers), and the storage infrastructure. In order to aggregate and deliver services across the data center to remote users, the compute infrastructure must seamlessly integrate all three of these elements.

Additionally, enterprise data center operators and administrators are looking for a way to simplify their LAN and SAN networks. FCoE and FC gateway technologies provide the opportunity to converge I/O in the racks. Data center bridging functionality supports efficient iSCSI and NAS storage as well as strengthening Ethernet to support lossless FC traffic.

Today’s multitier network infrastructure solutions do not offer the simplicity nor do they provide the flexibility required to successfully support today’s business initiatives and applications. To thrive in today’s dynamic and complex world, enterprise data centers need a simple, secure, easy to operate, no compromise network infrastructure.

## The Juniper Networks Enterprise IT Data Center Network Solution

Juniper's enterprise IT data center solution offers organizations a high-performance networking data center infrastructure technology based on 10GbE and 1GbE connectivity to servers, network attached storage and storage area networks, multi 10GbE+ stateful firewall services gateways, and state of the art edge connectivity devices. The solution runs on Juniper Networks® Junos® operating system, which tremendously simplifies operations, and is built to scale by utilizing fabric and virtualization technologies.

Juniper's enterprise data center network solution offers a powerful 10GbE server access solution and is ideally suited for organizations striving to optimize the Ethernet connectivity across clusters of virtualization platforms and distributed applications.

The enterprise IT data center network solution is built on the foundation of the Junos operating system. This significantly improves the overall OpEx involved in maintenance of the DC network infrastructure as well as support emerging business applications. Junos Space Virtual Control eliminates traditional configuration issues by providing a single pane of glass provisioning system for both physical and virtual switch ports.

Juniper offers a variety of products to build high performing and secure data centers. At large scale, Juniper's leading edge QFabric™ technology is offered to customers with a desire for 1,000's of 10GbE access ports. QFabric technology offers a single tier of data center networking throughout the entire data center. In the described solution, QFX3500 Nodes, which are part of the QFabric system, are offered as ToR switches to fulfill all of the 10GbE server access requirements, and support future migration to a QFabric architecture when the majority of the data center network requires 10GbE for server connectivity.

The described solution profile enables providers to take advantage of the opportunity to converge I/O in the rack. Servers can connect to the Juniper Networks QFX3500 Switch using a converged network adaptor (CNA) or standard ethernet interface card - over 10GbE data center Ethernet channeling both storage (i.e. NAS, iSCSI, FC SAN, FCoE) and data traffic over a single interface. The QFX3500 devices can connect directly to the data center storage array functioning as a Fiber Channel (FC) gateway over native Fiber Channel (FC) connections, FC transit switch, or Ethernet switch with deep buffering and strict traffic prioritization to support the required resource for storage traffic.

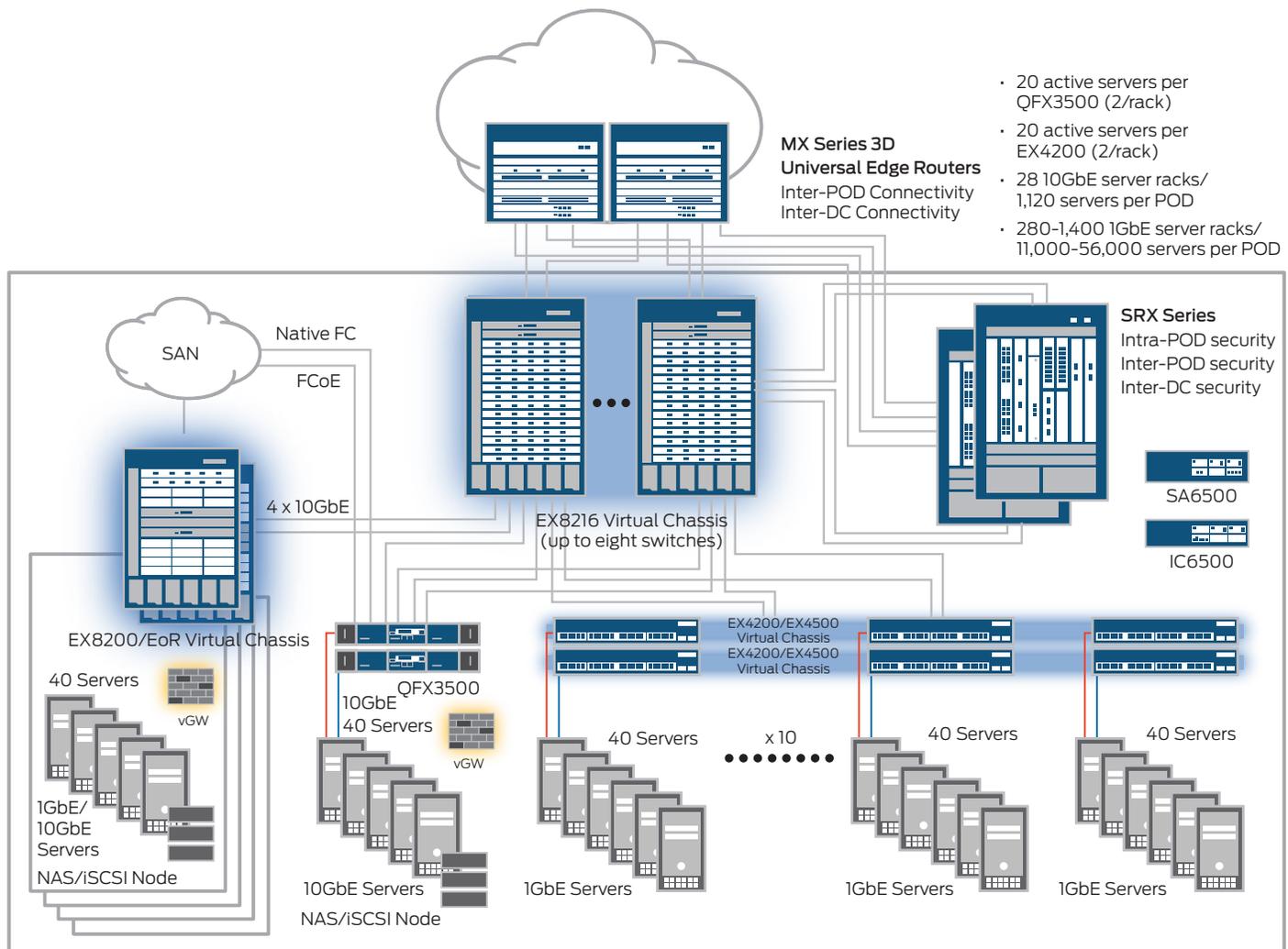


Figure 1: Juniper enterprise IT data center network

One of the most advanced capabilities of the enterprise data center infrastructure solution is the rich ability of the security devices to enforce security policy and monitor network and application activities throughout the physical and virtual infrastructure. Combining the rich and powerful security enforcement and monitoring capabilities of the Juniper Networks SRX5000 line of services gateways with the advanced virtual server security capabilities of the Juniper Networks vGW Virtual Gateway, data center security operators can easily assure that the security policy is enforced at physical and virtual workloads with ease, and without the need to re-configure security operation for both environments.

By implementing an enterprise IT data center solution, organizations will be able to support the latest available virtualization platforms and distributed applications. The solution offers support for a variety of multicast applications using the Junos OS L3 functionality suite on Juniper Networks EX8200 line of Ethernet switches, the switching core that supports VPLS across multiple locations using the Juniper Networks MX Series 3D Universal Edge Routers to transparently connect application nodes and mobilize workloads while offering seamless high availability.

Enterprises that desire enhanced MPLS-based network virtualization, scalable advanced routing functionality (such as QoS) and throughput can design the core with Juniper Networks MX960 3D Universal Edge Routers and smaller MX Series, such as Juniper Networks MX80 3D Universal Edge Routers, for the WAN edge.

The enterprise IT data center scales modularly to satisfy the capacity requirements of a variety of business units and applications. The basic compute and application point of delivery (POD) network infrastructure is constructed of Juniper Networks EX4200 line of Ethernet switches with Virtual Chassis technology, and QFX3500 server access switches connected through up to eight EX8200 core switches operating as a single Virtual Chassis configuration. The QFX3500 10GbE switches can later be used as part of a QFabric system as ToR nodes as requirements and progress demand.

Juniper's enterprise IT data center network layout offers a U-shape uplink connectivity scheme that enables active-active uplink redundancy with active/backup server NIC connections. There are three main server access topologies that are supported using the Juniper enterprise data center network profile as follows:

1. Using the EX4200 1GbE access switch in a ToR setting; up-to 10 server racks will be jointly configured as a single Virtual Chassis, each server rack will host a pair of EX4200 switches, each member of a separate Virtual Chassis configuration. Effectively each server connects up to both Virtual Chassis configurations with a redundant (active/backup) interface setting. It is recommended to pull from each Virtual Chassis four 10GbE uplinks connecting to Juniper Networks EX8216 Ethernet Switches deployed in a Virtual Chassis configuration. With over 200 active servers connected to each EX4200 Virtual Chassis, and eight 10GbE uplinks from each EX4200 Virtual

Chassis connected up to 8XGbE line cards on the EX8216 Virtual Chassis (reserving two line cards for auxiliary and cross connections), the data center network template can host over 12,000 servers with a 1:5 uplink oversubscription ratio, 1:3 rack row oversubscription, and no rack level oversubscription. With increasing the number of 10GbE uplinks from each Virtual Chassis to the EX8216 the oversubscription ratio can become better while hosting a more modest count of servers.

2. Using the QFX3500 10GbE access switch in a ToR setting; each server rack will host a pair of QFX3500 switches. Effectively each server connects up to both QFX3500's with redundant 10GbE interfaces. It is recommended to pull from each QFX3500 four to eight 10GbE uplinks connecting to redundant EX8216 core switches, up to eight of which can be deployed in a single Virtual Chassis configuration. With up to 40 servers in each rack, and four 10GbE uplinks from each QFX3500 connected up-to 8xGE line cards on the EX8216, the data center network template can host 4,800 servers with a 1:5 uplink oversubscription ratio. With increasing the number of 10GbE uplinks from each QFX3500 the oversubscription ratio can become better while hosting a smaller count of 10GbE servers. This setup allows future migration into a complete QFabric system.
3. Using Juniper Networks EX8208 Ethernet Switch as an end of row switch setting; each server row of up to eight racks will host a pair of EX8208 switches. Each slot on the EX8208 accommodating either a 40XGbE line card or a 48x1GbE line card. In both cases, the servers will connect using a redundant interface setting to each of the EX8208 using patch panel connections.

To scale beyond a single POD, the MX Series can interconnect multiple PODs and locations in a seamless manner such that operationally all locations are similar, and connectivity maintained at Layer 2 or Layer 3 as desired. Obviously, the bandwidth characteristics across PODs will change.

In addition to the network connectivity, the Juniper enterprise IT data center solution offers a powerful set of network-based services. Mainly clusters of ultra-high speed SRX5000 line of services gateways supporting over 100 Gbps in stateful firewall and 30 Gbps in IPS services with the ability to enforce identity and application-based policies. In enterprise environments, providing a set of remote access capabilities for employees to seamlessly access business applications is enabled through the use of the Juniper Networks SA6500 SSL VPN Appliances and IC6500 Unified Access Control Appliances to control access into data center services from company controlled facilities and offices. Both the IC Series and SA Series platforms scale by implementing clustering services. Additionally, the Juniper Networks WXC Series Application Acceleration Platform can enable accelerated remote and site to site access to applications.

## Features and Benefits<sup>1</sup>

- Multiples of 12,000 1GbE servers per POD for modular scalability and optimal control
- Multiples of 1,200 10GbE servers per POD for modular scalability and optimal control
- Supporting 30 40-server racks per 10GbE POD; supporting 300 40-server racks per 1GbE POD
- Increments of 120 Gbps firewall performance for maximum secured throughput capacity in the POD
- Up to 30 Gbps intrusion prevention system (IPS) performance
- Full Junos OS automation and instrumentation support
- Non-blocking intra-rack connectivity (up to 480 Gbps)
- 1:25 uplink oversubscriptions (non-blocking access and core)
- 200,000 multicast routes at data center core with 8,000 at each access switch
- IPv6 support
- Advanced routing and virtualization support with up-to 8,000 VPLS instances
- QoS and ACL Line rate performance
- Up to 1 million MAC Address

**Table 1: Solution Components**

Software Product	Hardware Product	Service and Support Offering
<b>Junos Space device management</b> <ul style="list-style-type: none"> <li>• Ethernet Design</li> <li>• Network Activate</li> <li>• Virtual Control</li> <li>• Security Design</li> </ul> <b>vGW Virtual Firewall</b>	<b>MX Series</b> (network core and edge) <b>EX8200 line</b> (network core) <b>QFX3500</b> (server access and QFabric Node) <b>EX4200 line</b> (access) <b>SRX5000 line:</b> <ul style="list-style-type: none"> <li>• AppSecure</li> <li>• AppTrack</li> </ul> <b>SRX6500 and IC6500</b> <b>WXC Series Application Acceleration Platforms</b>	<b>Professional Services</b> <ul style="list-style-type: none"> <li>• Assessment and Analysis Services</li> <li>• Planning, Design and Testing Services</li> <li>• Implementation and Optimization Services</li> </ul> <b>Juniper Care</b> <ul style="list-style-type: none"> <li>• Junos Space Service Now automated remote support</li> <li>• Product maintenance (multiple service levels through 24x7) e-support</li> <li>• Phone support</li> </ul> <b>Juniper Care Plus</b> <ul style="list-style-type: none"> <li>• Network environment availability focused</li> <li>• Junos Space Service Insight remote service automation</li> <li>• Expert-to-Expert access</li> <li>• Personalized account focused Services</li> <li>• Advanced Services for customized product/system performance tuning</li> </ul> <b>Juniper Care Experts</b> <ul style="list-style-type: none"> <li>• Resident Engineers</li> <li>• Resident Consultants</li> </ul> <b>Education Services</b> <ul style="list-style-type: none"> <li>• Knowledge transfer</li> <li>• Junos OS and Juniper Technical Training</li> <li>• Juniper Networks Certification Program</li> </ul>

## Summary

Juniper's enterprise IT data center network solution offers a simple, scalable, and future proof infrastructure ideally suited for the ever changing demands of business and IT. This solution supports a few hundred to tens of thousands of servers connected through a fully redundant data center network infrastructure.

Juniper Networks provides leading-edge solutions for enterprises across the globe. Juniper's enterprise IT data center network solution offers high performance and functionality at very attractive price points, allowing businesses to enjoy the operational efficiency and cost saving benefits of agility, resiliency, and high performance.

## Next Steps

For more information regarding Juniper Networks data center infrastructure solutions, go to [www.juniper.net/datacenter](http://www.juniper.net/datacenter) or contact your local Juniper partner.

For more information regarding the design of the Juniper data center network, please refer to:

[www.juniper.net/us/en/local/pdf/design-guides/8020010-en.pdf](http://www.juniper.net/us/en/local/pdf/design-guides/8020010-en.pdf).

To find a Juniper partner in your area, please view the following list of resources:

[www.juniper.net/us/en/partners/locator](http://www.juniper.net/us/en/partners/locator).

For more information about SRX Series Services Gateways, please see:

[www.juniper.net/us/en/products-services/security/srx-series](http://www.juniper.net/us/en/products-services/security/srx-series).

For more information about EX Series Ethernet Switches, please see:

[www.juniper.net/us/en/products-services/switching/ex-series](http://www.juniper.net/us/en/products-services/switching/ex-series).

For more information on the QFX3500, please see:

[www.juniper.net/us/en/products-services/switching/qfx-series](http://www.juniper.net/us/en/products-services/switching/qfx-series)

For more information about MX Series 3D Universal Edge Routers, please see:

[www.juniper.net/us/en/products-services/routing/mx-series](http://www.juniper.net/us/en/products-services/routing/mx-series).

For more information about Junos Space, please see:

[www.juniper.net/us/en/products-services/software/junos-platform/junos-space](http://www.juniper.net/us/en/products-services/software/junos-platform/junos-space).

For more information about Juniper services, please see:

[www.juniper.net/us/en/products-services](http://www.juniper.net/us/en/products-services).

<sup>1</sup> Features and benefits refer to the overall solution offering capabilities. Due to the fact the solution can be comprised from a variety of products, it is recommended to check with your account team.

## About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at [www.juniper.net](http://www.juniper.net).

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