Data Center Networking for Federal

Building next-generation data centers to support virtualization and private cloud for Federal

Challenge

Federal data centers need simple, agile networks to support the exploding demand for applications, analytics, virtualized workloads, and private cloud services.

Solution

Juniper Networks Data Center Networking for Federal

Benefits

- Build high-performance, scalable, next-generation data center to support mission-critical operations
- Reduce OpEx and simplify management with automation
- Leverage common building blocks for a coherent, industry-leading data center fabric architecture
- Achieve higher levels of IT performance and agility to meet mission objectives

From digital services to data center consolidation, Federal agencies need higher levels of IT performance and agility to meet mission objectives, deliver services to citizens, and protect national interests—all with greater efficiency and flexibility than ever before. Providing agency and department staff with anywhere, anytime access to key insights and critical resources is placing new pressures on the data center, driving the need for high-performance networking.

The Challenge

Most data centers were built to optimize the delivery of client/server applications, but as Federal IT continues to virtualize servers and applications, legacy network architectures are straining under the new requirements for high performance and agility. Virtualization fundamentally changes traffic patterns in the data center, with the heaviest loads occurring between servers and across data centers, rather than from server to client as with legacy applications. Federal IT staff needs the ability to automatically move virtual workloads not only within a data center pod, but also across geographically dispersed data centers—without manual and time-consuming network reconfiguration.

Data center performance must scale gracefully. Demanding applications, powerful compute, and massive storage volumes are driving the need for 40GbE, 100GbE, and beyond. To deliver the necessary levels of performance and availability, the data center network must become faster, more agile, and more scalable. Integration between the physical and virtual layers is essential as Federal advances its use of virtualization.

Many agencies have begun their cloud journey, but they must support legacy applications and multitenant private data centers for the foreseeable future. Support for legacy applications requires pervasive Layer 2 connectivity in the data center as well as native cloud applications. A data center fabric architecture that supports both legacy applications and cloud services allows agencies to migrate applications and services on their own terms.

With budget constraints an ongoing issue, Federal IT must find new ways to lower capital expenses (CapEx) and operational expenses (OpEx). A network that is vastly simpler to operate relieves the operational burden on IT staff and lowers OpEx.

Juniper Networks Data Center Network Solution for Federal

Juniper Networks' data center network solution provides agencies with a data center infrastructure that delivers the highest levels of performance, availability, and automation—and provides a strong foundation for the migration to the cloud. With Juniper, agencies can evolve from traditional three-tier network architecture to a two-tier, spine-leaf architecture that will deliver greater performance, agility, and scale.

Juniper offers Federal IT a choice of data center fabric architectures to support legacy applications, highly virtualized workloads, large-scale virtualization, and private cloud. Federal IT teams can choose the performance and scale that best fit their needs, while maintaining a set of common building blocks for the data center fabric.

- **Multitier multichassis link aggregation group (MC-LAG).** Agencies can implement multitier MC-LAG to gain the ability to support Layer 2 VLAN stretch with the ability to extend VLANs anywhere. Using MC-LAG delivers the greatest operational simplicity. Multitier MC-LAG provides redundancy and load balancing across multiple LAGs.
- **Ethernet Fabric.** Agencies can choose an Ethernet fabric technology, including Juniper Networks® Virtual Chassis Fabric (VCF), QFabric® System, or Junos® Fusion, to support L2 and L3 traffic in a single fabric. Automation is supported and IT gains a single point of management across the fabric.
  - **Virtual Chassis Fabric.** VCF is a low-latency, high-performance fabric architecture that can be managed as a single device. VCF is optimized to support small and medium-sized data centers that contain a mix of 1 Gbps, 10 Gbps, and 40 Gbps Ethernet interfaces.
  - **QFabric System.** The QFabric System provides high-performance, any-to-any connectivity, and management simplicity. QFabric is highly scalable and improves application performance with low latency and converged services in a nonblocking, lossless architecture that supports L2, L3, and Fibre Channel over Ethernet (FCoE).
  - **Junos Fusion.** Junos Fusion is Juniper Networks' innovative architecture for cloud scale data centers. Junos Fusion simplifies operations at scale and makes it easy to provision large data centers. Junos Fusion combines the access and aggregation layers in the data center, creating a simple, central interface for managing a large data center from a single or pair of cluster devices. With Junos Fusion, top-of-rack access switches (called satellite devices) appear as remote line cards in one or a pair of aggregation switches (called aggregation devices). This eliminates the need to manage individual access layer switches in the data center. Local L2 and L3 traffic can be switched within a rack, meeting the demands of today's heavily virtualized data centers.
- **IP Fabric.** Agencies that need carrier-class reliability to support large-scale Software as a Service (SaaS) or web services can use the Juniper Networks QFX10000 and QFX5100 switches to implement an IP fabric with L3 routing using OSPF or BGP. This approach is highly scalable and offers extensive traffic engineering capabilities.
- **IP Fabric with overlay.** Agencies can leverage Juniper solutions for the physical network while using VMware NSX for the overlay network. This allows IT to create smaller L2 domains that are connected over the more robust L3 network. With the ability to migrate virtual machines between servers in separate L2 domains, resources can be dynamically allocated within or between data centers.

Features and Benefits

- **Support purpose-built and private cloud data centers.** Federal agencies can leverage Juniper Networks to support legacy applications, large-scale virtualization, as well as private cloud services. Juniper uses common building blocks for the data center fabric options, enabling agencies to preserve their investment even as their requirements evolve. With Juniper, agencies can choose the right data center from the cloud network architecture that best fits their needs today—while providing a path forward that allows agencies to move at their own pace.
- **Support workload mobility and data center stitching.** Junos Fusion allows seamless workload mobility to anywhere in a pod as well as connectivity to other L2 or L3 workloads. By leveraging Ethernet VPN, multiple Junos Fusion systems can be seamlessly connected over MPLS or Virtual Extensible LAN (VXLAN), allowing mobility of workloads across pods as well as application scale.
- **Simplify data center operations and reduce OpEx.** Agencies can leverage Junos Fusion to simplify data center provisioning, management, monitoring, and maintenance. For instance, the network can support workload mobility without manual intervention with capabilities such as automatic VLAN sensing, which allows IT to configure all tenant segments upfront, but traffic won't be sent to those VLANs until they are actively used. Agencies using VMware vCenter can leverage integration with Juniper Networks Junos Space Network Director to automate VLAN orchestration, simplifying the common operational task of adding VLANs as new applications are provisioned or as new servers and VMs are added.
- **Orchestrate and automate network operations.** Zero touch deployment (ZTD) allows Federal IT managers to use wizards to set up the network fabric, while configuration and image files are automatically provisioned. Junos Space Network Director provides a single pane of glass for management, allowing IT to visualize, analyze, and control both virtual and physical networks. In addition, IT can leverage Juniper's open APIs and open source tools to automate and simplify data center network operations. Automation is supported through Puppet, Chief, Ansible, and Python.
- **Enjoy industry-leading performance and reliability.** QFX10000 switches deliver unparalleled scale and feature richness, helping Federal agencies build automated data center networks to support even the most demanding analytics, cloud services, and multitenant environments. With the reliability and availability critical to supporting mission operations, Federal agencies can count on the

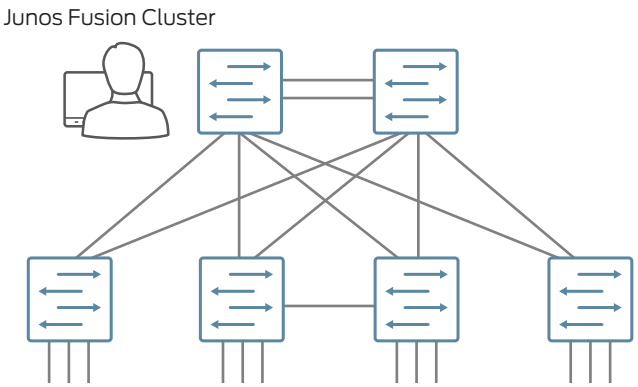

Figure 1: Juniper delivers data center networking with simplified management at scale, with a single point of configuration and management for a data center pod of up to 128 racks.

Solution Components

	Multitier MC-LAG	L2/L3 Ethernet Fabric with Virtual Chassis Fabric	L2/L3 Ethernet Fabric with QFabric System	L2/L3 Ethernet Fabric with Junos Fusion	IP Fabric with QFX10000 and QFX5100 Switches	IP Fabric with Overlay
Key benefits	• Multivendor data center • Large data center • High availability	• Single point of management • Mixed 1GbE, 10GbE, and 40GbE servers • Overlay support	• Single point of management • Optimized for 10GbE and 40GbE • Performance at scale • Broad customer base	• Plug-and-play provisioning • Multi-version support • Open standards and programmability via IEEE 802.1BR and JSON-RPC APIs • 1GbE, 10GbE, 40GbE, and 100GbE	• Very large scale-out • Extends across pods or across data centers	• OpenStack orchestration • VMware/Junos OS integration • VMware policy control and provisioning
Scale	• Up to 13,824 10GbE servers at 3:1 oversubscription	• Up to 28 leaf nodes	• Up to 128 member switches	• Up to 128 leaf switches	• Up to 110,563 10GbE servers at 3:1 oversubscription	
Solution	• Spine: Two QFX10000 switches • Leaf: Up to 288 QFX5100 switches	• Spine: Four QFX5100 switches • Leaf: Up to 28 QFX5100 switches or Juniper Networks EX4300 Ethernet Switches	• Spine: 4 QFX3008 switches • Leaf: 128 QFX5100, QFX3500, or QFX3600 switches	• Spine: 2 Juniper Networks MX Series 5G Universal Routing Platforms or QFX10000 switches • Leaf: Up to 128 QFX5100 switches	• Spine: 16 QFX10000 switches • Leaf: Up to 2,304 QFX5100 switches	• MX Series routers or QFX5100 or EX9200 switches and VMware NSX

carrier-grade Juniper Networks Junos operating system. In addition, the Junos OS running on the QFX10000 has been enhanced for greater scalability, modularity, and programmability, providing agencies with high-performance switches that deliver unparalleled innovation.

- **Leverage a single point of management.** IT staff can leverage Network Director to visualize, analyze, and control the entire network—from data center to campus, physical to virtual, and wired to wireless—all through a single management screen. IT staff can manage and synchronize both physical and virtual environments, including Ethernet and IP fabric choices, ensuring that network policies follow workloads as they move from server to server or VM to VM.

Summary—High-Performance Data Center Networking for Federal

With a next-generation data center, Federal IT can continue to reap efficiencies and cost savings, whether the agency is focused on reducing data center sprawl or building some of the largest data centers in the world. With Juniper, Federal can choose the right data center architecture to support mission operations today, and have confidence that the data center network will scale as operations demand well into the future.

Next Steps

To get started with your agency's next-generation data center, visit www.juniper.net/Federal.

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

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