

FLATTEN YOUR DATA CENTER ARCHITECTURE

Business Triggers Can Enable the Migration to a Simpler, More Efficient Data Center Network

Challenge

Many of today's data center networks were designed to accommodate 5-10 year old traffic patterns. These architectures are sub-optimal in terms of performance, complexity, and cost, but most organizations don't want to disrupt their operational production data center to upgrade.

Solution

Trigger events initiated by an organization's business requirements provide the opportunity to begin migration to a Juniper Networks 3-2-1 Data Center Network Architecture. These migrations can proceed in controlled ways within existing legacy data center architectures without disrupting business operations.

Benefits

A flatter data center LAN design built on high-performance platforms can lower capital and operational expenses without compromising performance. Simplifying the design and sharing resources, combined with integrated security, enables an organization to take advantage of a cloud computing-based infrastructure to deliver on-demand services to any point on the network.

IT has become integral to business success in virtually all industries and markets. Today's data center is the central repository of computing resources, enabling enterprises to meet their business objectives. Today's data center traffic flows and performance requirements have changed considerably from the past with the advent of cloud computing and service-oriented architecture (SOA)-based applications. In addition, increased mobility, unified communications, compliance requirements, virtualization, the sheer number of connecting devices, and changing network security boundaries present new challenges to today's data center managers. Architecting data centers based on old traffic patterns and outdated security models is no longer efficient and results in lower performance, unnecessary complexity, difficulty in scaling, and higher costs.

A simplified, cloud-ready, two-tier data center design can address these new challenges—without any compromise in performance. Migrating to such a data center network from an existing legacy data center infrastructure could theoretically take place at any time; the question is how and where to begin?

The Challenge

Many enterprises have taken on server, application, and data center consolidations to reduce costs and increase returns on their IT investments. To continue their streamlining efforts, many organizations are also considering cloud computing as a new infrastructure model to create dynamic scalable resource pools. However, many data center networks in operation today were designed for 5 to 10 year old traffic patterns and are not optimal for the current application and traffic flow environment. These designs typically result in lower performance, unnecessary complexity, and higher costs. While most organizations accept the need for change, the vast majority don't want to disrupt their operational production data center to begin the transition to a simpler, high-performance network design.

Trigger Events for Change and Their Associated Insertion Points

Migrating to a flatter, simpler two-tier design can begin at various insertion points, triggered by business events. The migration can then proceed in controlled ways within the existing legacy data center architecture.

Following is a short list of trigger events that can motivate an organization to make the investment required to address these events with data center infrastructure change:

- Provisioning a new area or Point of Delivery (POD) in an existing data center due to increasing demands for new applications and services. The new applications may also have higher performance requirements that cannot be delivered by the existing infrastructure.

- Technology refresh due to either end of life (EOL) on a given product line or an upgrade to the latest switching or server technology (or both). A refresh can also be driven by the end of an equipment depreciation cycle, company policy regarding available headroom capacity, or the need for additional capacity to meet planned future expansion.
- Infrastructure redesign due to increased use of server virtualization.
- Data center consolidation due to a merger or acquisition, cost saving initiatives, or moving from an existing colocation facility. Due to the increased scalability, performance, and high availability (HA) requirements, data center consolidation may also require a technology refresh.
- Business continuity and workload mobility initiatives. Delivering HA and virtual machine application mobility typically requires “VLAN stretching” within or between data centers.
- Upgrade to the core data center network for higher bandwidth and capacity to support new capabilities such as server virtualization/workload mobility or higher application performance. This may also be due to a technology refresh as a result of the retirement of EOL legacy equipment.
- Need for higher performance and scale in security. Existing security gateways, whether integrated in a chassis or running as standalone appliances, may not be able to deliver the performance required to support the increased traffic from data center consolidation, growth in connected devices, increased extranet collaboration, and internal/external compliance and auditing requirements. Server, desktop, and application virtualization may also drive changes in the security model to increase the robustness of security in the new environments

and ease complexity in management. Enhancements can be made to the core, edge, or virtual server areas of the data center network to deal with these requirements.

Addressing any or all of these trigger events results in deploying new technologies into the access, aggregation, core, or services tiers of an existing data center network—places where an organization can begin the migration towards a simpler, more efficient high-performance infrastructure. Best practices and key installation tasks for migrating to a more efficient data center are detailed in the Juniper Networks Data Center LAN Migration Guide (www.juniper.net/us/en/local/pdf/design-guides/7100128-en.pdf).

The Juniper Networks 3-2-1 Data Center Network Architecture

Juniper’s strategy for simplifying the data center network is called the 3-2-1 Data Center Network Architecture, which eliminates layers of switching to “flatten” and collapse the network from today’s three-tier tree structure to two layers, and in the future just one (see Figure 1). A key enabler of this simplification is achieved by deploying Juniper’s Virtual Chassis fabric technology, which interconnects multiple physical switches to create a single, logical device that combines the performance and simplicity of a switch with the connectivity and resiliency of a network. Organizations can migrate from a three-tier to a two-tier network beginning with any of the previously described trigger events, or they can move directly into a Juniper-enabled data center fabric as it becomes available.

The steps to migrate from an existing three-tier network to a flatter design, as articulated by the Juniper Networks 3-2-1 Data Center Network Architecture, is built on four core principles—simplify, share, secure, and automate. Creating a simplified infrastructure with shared resources and secure services delivers

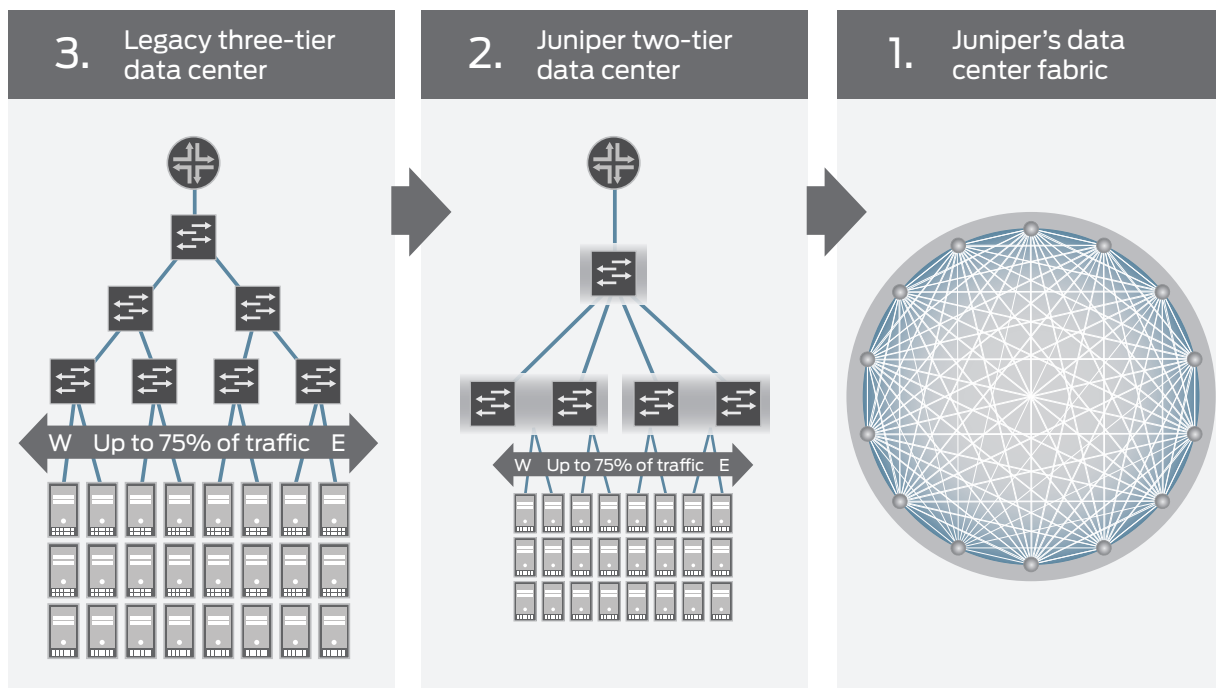


Figure 1: Juniper Networks 3-2-1 data center network architecture

significant advantages over other designs. It lowers costs, increases efficiency, and keeps the data center agile enough to accommodate any future business changes or technology infrastructure requirements.

- Simplify the architecture: Consolidating legacy siloed systems and collapsing inefficient tiers results in fewer devices, a smaller operational footprint, and simplified management.
- Share the resources: Segmenting the network into simple, logical, and scalable partitions with privacy, flexibility, high performance, and quality of service (QoS) enables network agility to rapidly adapt to an increasing number of users, applications, and services.
- Secure the data flows: Integrating scalable, virtualized security services into the network core provides benefits to all users and applications. Comprehensive protection not only secures data flows into, within, and between data centers, it also provides centralized management and the distributed dynamic enforcement of application- and identity-aware policies.
- Automate network operations at each step: An open, extensible software platform reduces operational costs and complexity, enables rapid scaling, minimizes operator errors, and increases reliability through a single network operating system. A powerful network orchestration platform with innovative applications like Juniper Space enables network operators to leverage Juniper or third-party applications for simplifying operations and scaling application infrastructure to improve operational efficiency.

Juniper's data center LAN architecture embodies these principles and enables organizations of all sizes to build high-performance, next-generation, cloud-ready data centers.

Features and Benefits of a Flatter Data Center Network

Organizations which begin the migration towards a simpler, more efficient, flatter data center network can ultimately realize the following benefits:

- Efficiencies of a cloud-like infrastructure where resources are dynamically allocated to accommodate the changing capacity requirements of different applications and improve asset utilization levels. This type of on-demand service and infrastructure simplifies management, reduces operating and ownership costs, and allows services to be provisioned with unprecedented speed. Reduced application and service delivery times mean that the organization is able to capitalize on opportunities as they occur.
- Improve application performance by reducing latency and the number of device platform interactions required to complete a transaction.
- Achieve power savings. A flatter data center network with fewer devices requires less power, which in turn reduces cooling requirements. This can add up to substantial power savings.

- Increased operational efficiency. Ideally, a common operating system should be used to reduce errors, decrease training costs, ensure consistent features, and lower the cost of operating the network.

Considerations for Introducing an Alternative Network Infrastructure Provider

In some installations, a key consideration when evolving an existing infrastructure is the impact of introducing another vendor. Organizations can minimize any impact by using the same best practices they employ in a single vendor network. For example, it is sound practice to test interoperability and feature consistency before an implementation at any network layer. Many organizations do this today, since there are often multiple inconsistent versions of an operating system within a single vendor's portfolio, or even completely different operating systems within that portfolio. For example, the firewall or intrusion detection and prevention (IDP) platforms may have a different OS and interface than the switching products. Even within a switching portfolio, there may be different versions of the same operating system, each supporting different feature implementation and provisioning.

Networking protocols at Layers 2 and 3 are highly standardized. The end result of standardization is interoperability. It would be sound practice to migrate any proprietary protocols to widely deployed open standards protocols as a systematic part of network maintenance. Juniper's networking solutions are based on open standards.

It is also sound practice to limit fault domains and contain risks when introducing an additional vendor. This can be accomplished with a building block design for the target insertion point when deploying into an existing LAN. This approach allows for definition of the new insertion as a functional module, testing of the module in proof-of-concept (PoC) environments before deployment, and clean insertion of the new module into production after testing. As previously mentioned, PoC testing is often done as a best practice in a single vendor network as well.

Other steps that can ensure successful insertion of Juniper Networks technology into an existing data center LAN to begin the migration to a simpler more efficient flatter network include:

- Training
- Multi-vendor automation and management tools

Training

Using open standard protocols within the network eases the introduction of Juniper solutions, since basic constructs are similar and interoperability has usually been tested and proven ahead of time. Beyond the protocols, differences in the command-line interface (CLI) are usually easier to navigate than people initially think. Time after time, people familiar with other CLIs find themselves able to make the transition quickly due to the consistent, intuitive nature of the Juniper Networks® Junos® operating system, which is easy to learn and use. The simplicity

of Juniper's implementations typically minimizes the need for extensive training. However, Juniper does offer a variety of training resources to accelerate deployments. The Junos OS also has a tremendous amount of flexibility and user support built into it. And tools are available to convert existing configurations to Juniper.

The Junos OS also provides embedded automation capabilities to simplify operations and to maximize network availability by mitigating outages, which studies have shown are due to human error up to 70% of the time. A library of scripts that automate common operations tasks is readily available online for viewing and downloading. Categorized by function, the script with the best fit can easily be found. Refer to the Junos OS Script Library at www.juniper.net/us/en/community/junos/script-automation/library for a complete list.

Multi-Vendor Automation and Management Tools

In a multi-vendor environment, it is often critical to establish a foundation of multi-vendor management tools that work with existing suppliers, including Juniper. There are well established multi-vendor tools available in the network configuration and change management (NCCM) as well as fault and performance analysis areas. These tools, which work with equipment from all major vendors, include IBM Tivoli and Netcool, HP Opware, Infovista, CA Concord, SolarWinds, and others. The open interfaces inherent in Juniper Networks Junos Space network orchestration platform allows for integration into an existing network management environment.

Solution Components

Migrating towards a simplified data center design would involve one or more of the following Juniper platform solutions:

- Juniper Networks EX Series Ethernet Switches
- Juniper Networks MX Series 3D Universal Edge Routers
- Juniper Networks SRX Series Services Gateways
- Juniper Networks Junos operating system
- Juniper Networks Network and Security Manager, STRM Series Security Threat Response Managers, and Junos Space network management solutions
- Juniper Care Services

In addition, the Juniper Networks Cloud-Ready Data Center Reference Architecture communicates Juniper's conceptual framework and architectural philosophy in creating data center and cloud computing networks robust enough to serve the range of customer environments that exist today. It can be found at www.juniper.net/us/en/local/pdf/reference-architectures/8030001-en.pdf.

Summary—Start the Migration to a Simpler and More Efficient Data Center

It is interesting to note that even as vendors introduce new product lines, the legacy three-tier architecture remains as the reference architecture for data centers. And this legacy three-tier architecture retains the same limitations in terms of scalability and increased complexity. Migrating to a simpler data center design enables an organization to improve the end user experience, scale without complexity, and keep the data center agile enough to accommodate any future business changes or technology infrastructure requirements, while also driving down operational costs.

Next Steps

For more information on Juniper Networks solutions, please contact your authorized Juniper reseller or Juniper sales representative at 1-877-417-3455 or AmerSales@juniper.net.

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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